PIT AND QUARRY

LIBRARY
PERIODICAL

DECEMBER, 1938

Gravel Operator Recovers Gold on Large Scale . . . Newest Phosphate Plant of Swift & Co.
Turning Quarry Waste Into Terrazzo Chips . . . Precision Control of Ready-Mixed Concrete

ATTENTION, ALL BELT USERS!

Only* ONE *cord belt has this patented* BALANCED *construction that insures a true-running belt

BALANCED BODY made of heavy rope-cord spiralled continuously without a splice. Cord on opposing sides of belt axis is twisted in opposite directions to neutralize torque of cord.
BALANCED COVER laid parallel to axis of belt — made of fabric in which alternate warp threads are twisted in opposite directions to prevent side-creep.
RIGHT-HAND TWIST
LEFT-HAND TWIST
GOODYEAR COMPASS CORD BELT
balanced construction fully covered by U. S. and foreign patents

THE truly sensational success of the Goodyear COMPASS Cord transmission belt in solving industry's most difficult belting problems has led to many imitations seeking to capitalize on the magic word "cord."

But what makes the Goodyear COMPASS the truest-running, most nearly stretchless belt on the market—what gives it such exceptionally high flex-life and long wear—is a fully patented method of cord construction no other belt manufacturer can employ!

The Goodyear COMPASS Cord is a modernized flat belt version of the ancient rope drive. With rope drives, as you know, it is necessary to use grooved pulleys to keep the ropes from running off due to their torque or twisting action.

In the COMPASS this torque is balanced by twisting the ropes, or cords, on opposing sides of the belt axis in opposite directions. Alternate warp threads in the fabric cover are similarly twisted. This patented construction in both body and cover neutralizes any tendency to run off the pulley with an equal pull toward the opposite side, insuring a belt that runs true.

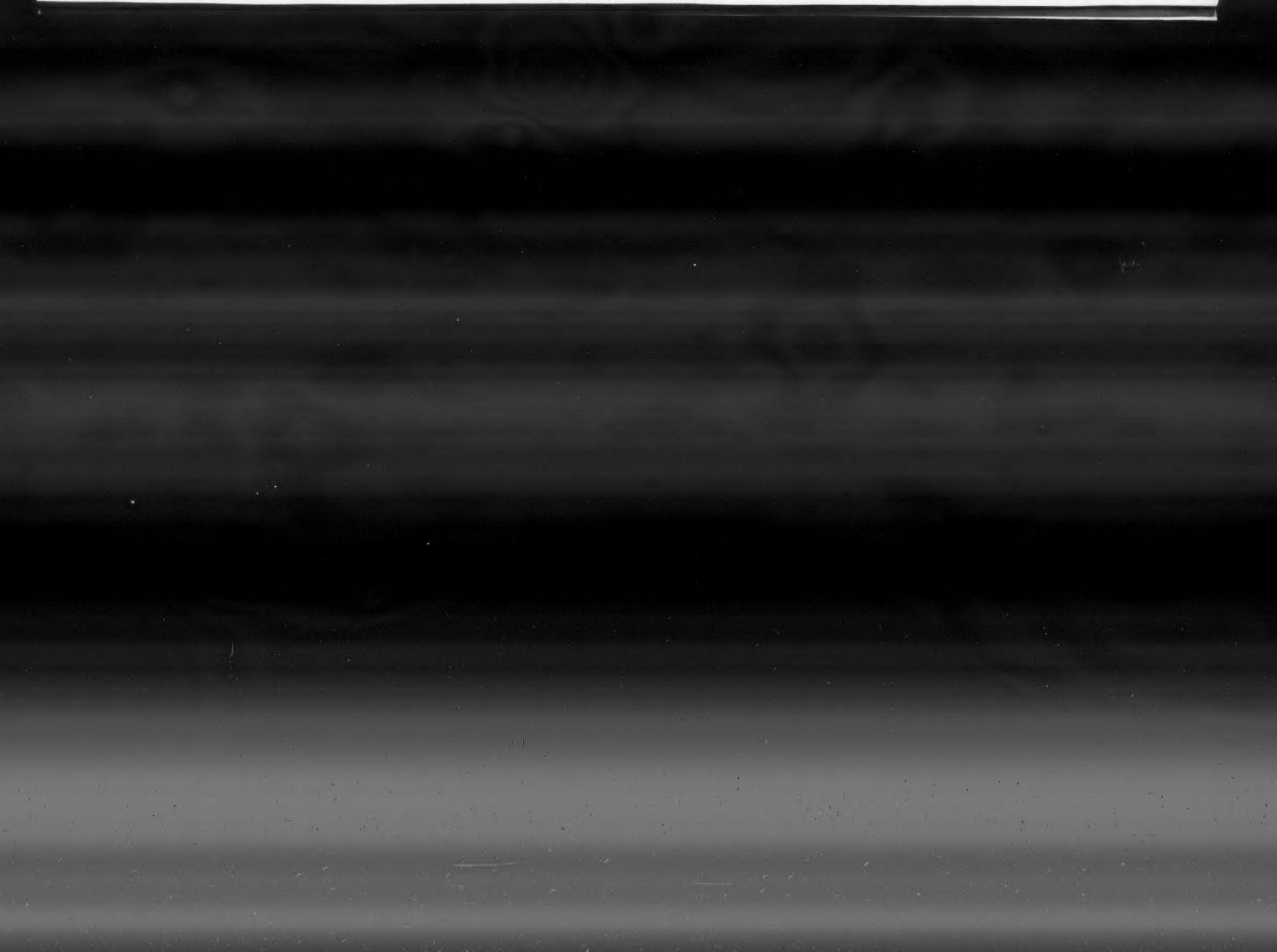
More than this, it permits Goodyear to use larger, stronger cord, eliminating fabric plies entirely in the carcass, and making a thinner, stronger belt with far higher flex-life and longer service-life.

The best proof of this is the remarkable performance of COMPASS belts on industry's hardest drives. From two to five times longer life with practically no stretch is typical. So don't be deceived by the word "cord." The Goodyear COMPASS Cord belt is the only belt in the world with patented balanced cord construction that insures true-running, high flex-life, low stretch and maximum wear. To test COMPASS superiority for yourself, call the nearest Goodyear Mechanical Rubber Goods Distributor.

BELTS
MOLDED GOODS
HOSE
PACKING
Made by the makers of Goodyear Tires

THE GREATEST NAME IN RUBBER

GOODYEAR



DURING THE WINTER PREPARE YOUR PLANT FOR SPRING

A Few Suggestions for Profitable MODERNIZATION

● Plan for lower operating costs and a better product when your plant opens up next spring, by making replacements and additions to your equipment now.

To take fullest advantage of the greater opportunities which should come from Government and other work, you must be able to meet rigid specifications.

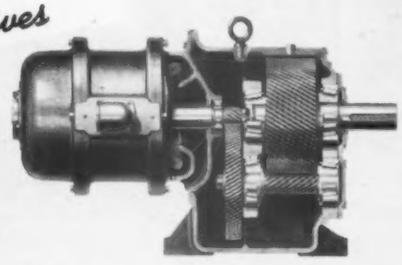
A few suggestions for profitable modernization are illustrated. There are others. Send for Book No. 1240.

Address: Link-Belt Company, Chicago, Philadelphia, Indianapolis, Atlanta, San Francisco, Toronto, or any of our other offices located in principal cities. 7601

Screening to Meet Rigid Specifications

Supplement your rotary screens with Link-Belt vibrating screens to obtain a better grading of the smaller sizes of gravel or stone. Rotary screens for better washing—vibrating screens for better sizing. The combination of both rotary and vibrating screens assures your ability to meet the most rigid specifications.

Replace Open Gear Drives

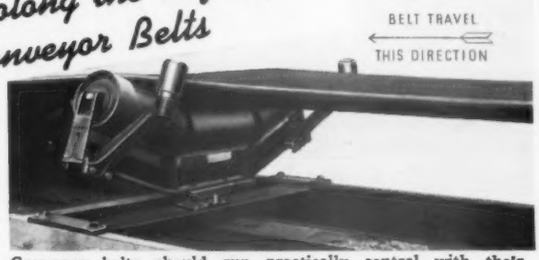


Greater efficiency as well as safety can be obtained by using Link-Belt speed reducers. The Link-Belt line includes herringbone gear, worm gear and motorized helical gear reducers as well as variable speed transmissions, silent chain and roller chain drives.

Anti-Friction Belt Conveyors

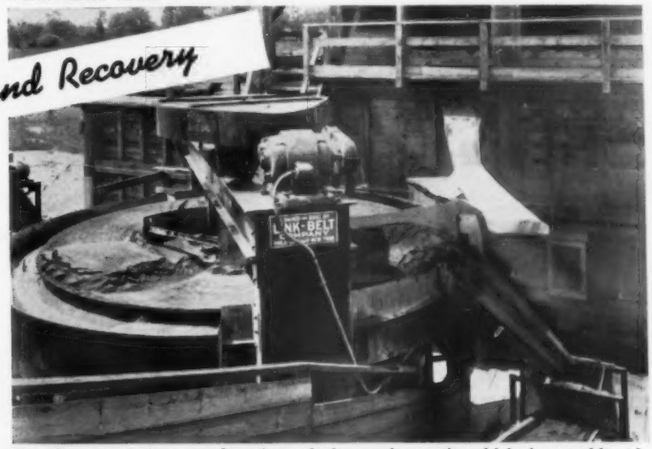
Replace your old, plain-bearing belt conveyor idlers with modern Link-Belt anti-friction bearing idlers. Save power, assure dependability and cut down maintenance costs.

Prolong the Life of Conveyor Belts



Conveyor belts should run practically central with their conveying or supporting idlers to avoid possibility of injury to belt edge in running against chutes, etc. When a belt does run with too much misalignment, the use of Link-Belt self-aligning idlers, spaced at intervals, corrects this condition by automatically "training" the belt to a central position.

Sand Recovery



The Rotoscoop is a perfected sand dewatering unit which is capable of recovering fine grains and discharging dry enough for truck transportation. Send for Folder No. 1463.

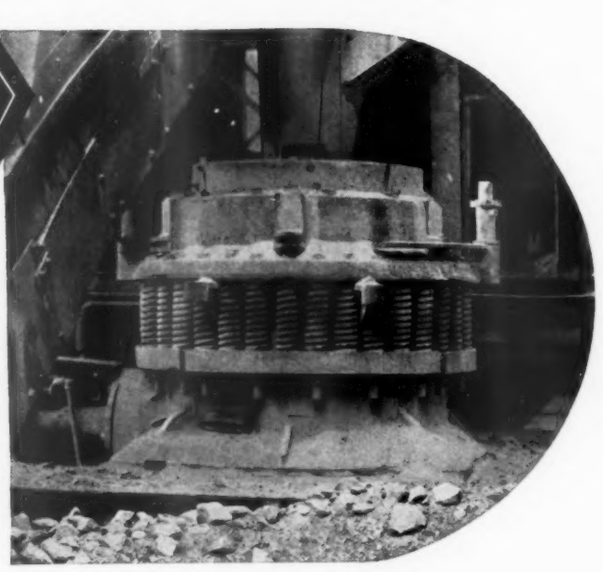
LINK-BELT

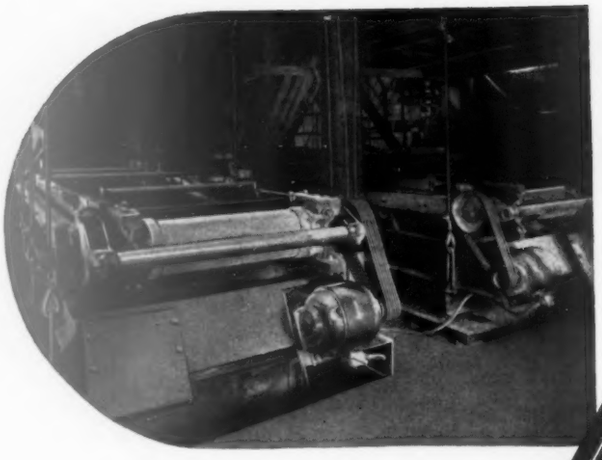
Equipment for Handling Sand, Gravel, Stone

PIT AND QUARRY, December, 1938. Vol. 31, No. 6. Published monthly by the Complete Service Publishing Company, 538 South Clark Street, Chicago, Ill. Subscription price $1 for 1 year in the U. S. and possessions, Canada, Central and South America; elsewhere $1 additional for each year. Single copies 20 cents. Entered as second-class matter February 28, 1932, at the Post Office at Chicago, Ill., under the act of March 3, 1897.

SYMONS *selected for both*

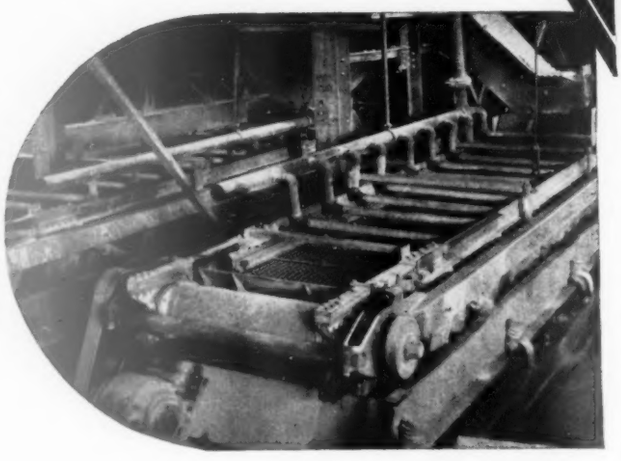
CRUSHING





AND

SCREENING



In addition to the Symons Standard Cone, the Short Head type is available where a greater quantity of finer product is desired. This crusher meets today's demands for finer crushed materials.

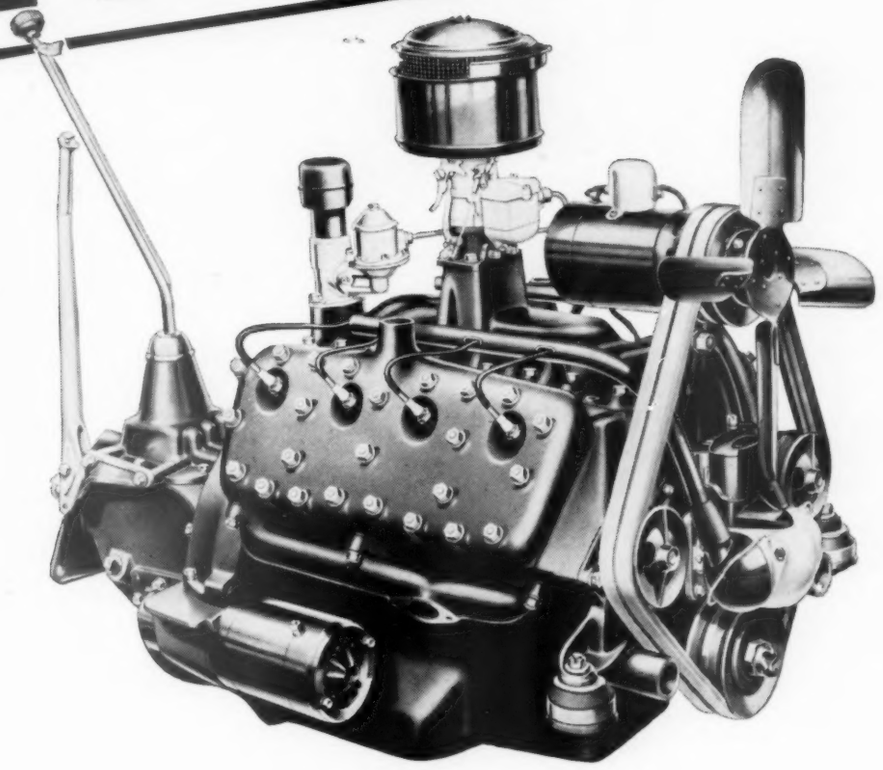
Here is another instance where a well-known producer of crushed materials selected Symons equipment as the best solution for the problems of finer crushing and closer sizing. The Symons Standard Cone Crusher, with its big capacity of fine product, is a vital factor in the lowering of crushing costs and an important step toward more profitable plant operation.

The four 4 x 16 foot double deck Symons Screens are doing the fine and coarse screening. With these screens set in a level position, more accurately sized materials are secured. A level screen with the lower headroom required also simplifies and lessens the expense of installation.

NORDBERG MFG. CO. MILWAUKEE WISCONSIN

NEW YORK CITY, 60 E. 42nd St. • LOS ANGELES, Subway Terminal Bldg. • TORONTO, Concourse Bldg. • LONDON, Bush House

LIFE BEGINS AGAIN



This Ford V-8 engine holds an impressive record for service. Behind it are thousands of miles of payload performance . . . countless tough jobs, done with the V-8 dependability and economy for which Ford engines are distinguished.

Now its second life begins. Factory reconditioned, it is ready to give new engine performance with new engine economy. That's the way the Ford Engine and Parts Exchange Plan works. And for you, this unique plan does two things:

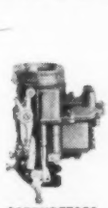
IT SAVES YOU TIME

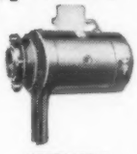
It's much quicker to get an exchange engine or other assembly through a Ford dealer than it is to tie up the truck and wait for the original unit to be repaired or overhauled. In the case of the engine, the Exchange Plan often cuts this time from days to hours.

IT SAVES YOU MONEY

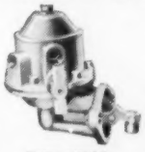
It's a Ford idea that the factory which builds the engine is best equipped to recondition it. Ford uses the same efficient methods, and the same types of precision machines in reconditioning that are used in making the original units. This cuts costs, and you get the savings.

These parts also included in the Ford Exchange Plan


CARBURETORS


GENERATORS

DISTRIBUTORS


FUEL PUMPS

CLUTCH DISC ASSEMBLY

SHOCK ABSORBERS

CLUTCH PRESSURE PLATE ASSEMBLY

ARMATURES

BRAKE SHOES

FORD V·8 TRUCKS AND COMMERCIAL CARS

SENSATIONAL SAVINGS

WITH THE

New Model "LF" = Load Forward

DEMPSTER-DUMPSTER UNIT

Larger Loads on Small Trucks
Lower Costs on Long Hauls
More Profits on Every Job

No Overhang
No Counterweight
No Sidesway

On the Conchas Dam, New Mexico, project, the U. S. Engineers are using twenty trucks equipped with DEMPSTER-DUMPSTERS hauling 2 cu. yd. loads of riprap stone from the quarry to the earthfill dam—There's a reason.

The new Model "LF" . . . Dempster Brothers' latest masterstroke of engineering . . . is recognized as the leader in its field today. It puts the load where it belongs, **forward,** with center support and eliminates frame strain . . . permitting higher capacities for small trucks.

With only a 1½-ton truck, equipped with Model "LF" Dempster-Dumpster unit, it is easy to handle 2 cu. yd. fully loaded containers, and travel at top speed on long or short hauls. With one-man control and automatic hoist and dump, the truck can handle four to ten detachable containers in relays . . . that's record economy unequalled by any other equipment.

The quick and wide acceptance of Model "LF" Dempster-Dumpster by both private construction and government engineers is a tribute to the efficiency of this modern equipment. **Write for Bulletin today.**

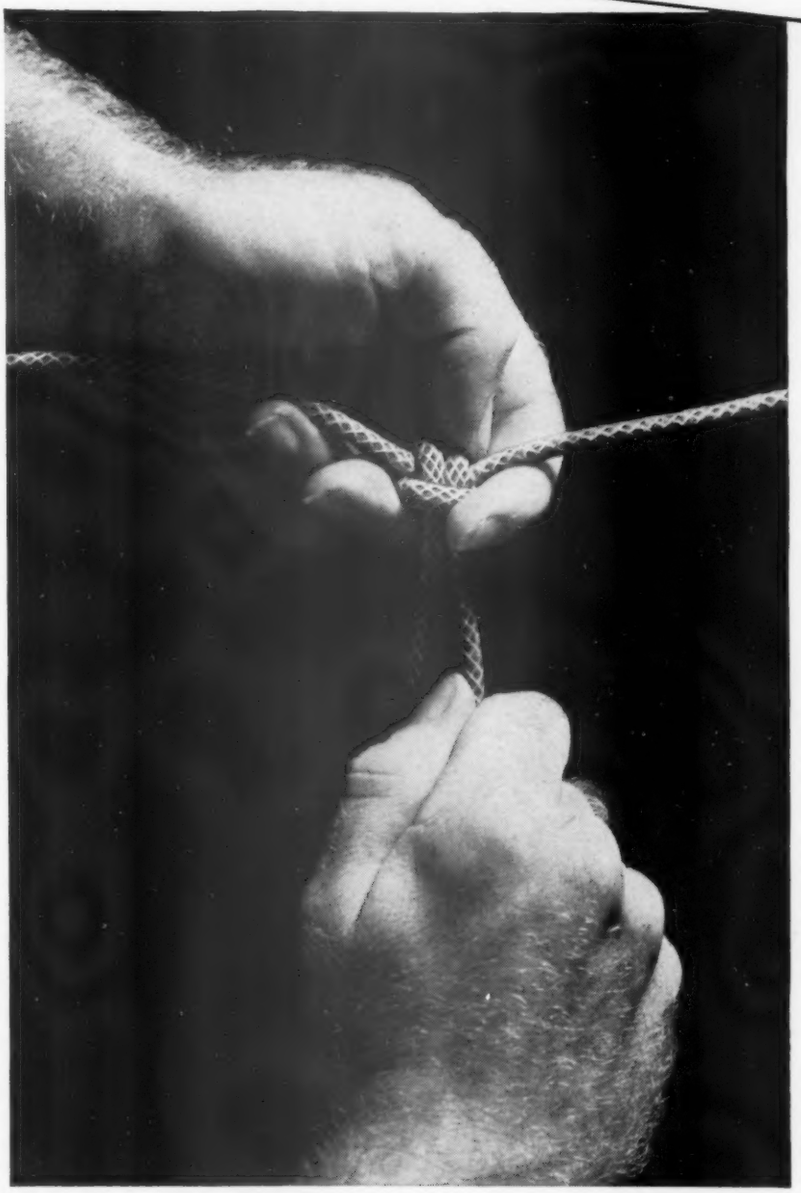
DEMPSTER BROTHERS, Inc. KNOXVILLE TENNESSEE

Washington New York Boston Nashville Chicago

NEW MODEL "LF"

New Model "LF" easily mounted on any truck chassis

Primacord the new Tie-up to Profits



This half hitch is the "switch" that connects each hole with the main line in a Primacord-Bickford hook-up.

Simple, isn't it! No tools are required to make this knot. Yet, made properly and drawn up tight, it switches the detonating wave at 3.85 miles per *second!*

Primacord-Bickford Detonating Fuse consists of a core of PETN in a waterproof textile cover. It offers economies in material, shipping, storing and handling. Plain Primacord weighs about 15 lbs. per 1,000 ft. and its tensile strength is 113 lbs. "Reinforced" and "Wire Bound" Primacord are also available where extra strength and resistance to abrasion are essential.

Tie-up to greater profits in blasting with the new, *well tried* detonating fuse. For further information write for the Primacord Booklet.

THE ENSIGN-BICKFORD COMPANY, SIMSBURY, CONN., U.S.A.
Makers of Cordeau-Bickford Detonating Fuse—and Safety Fuse Since 1836

PRIMACORD-BICKFORD *Detonating Fuse*

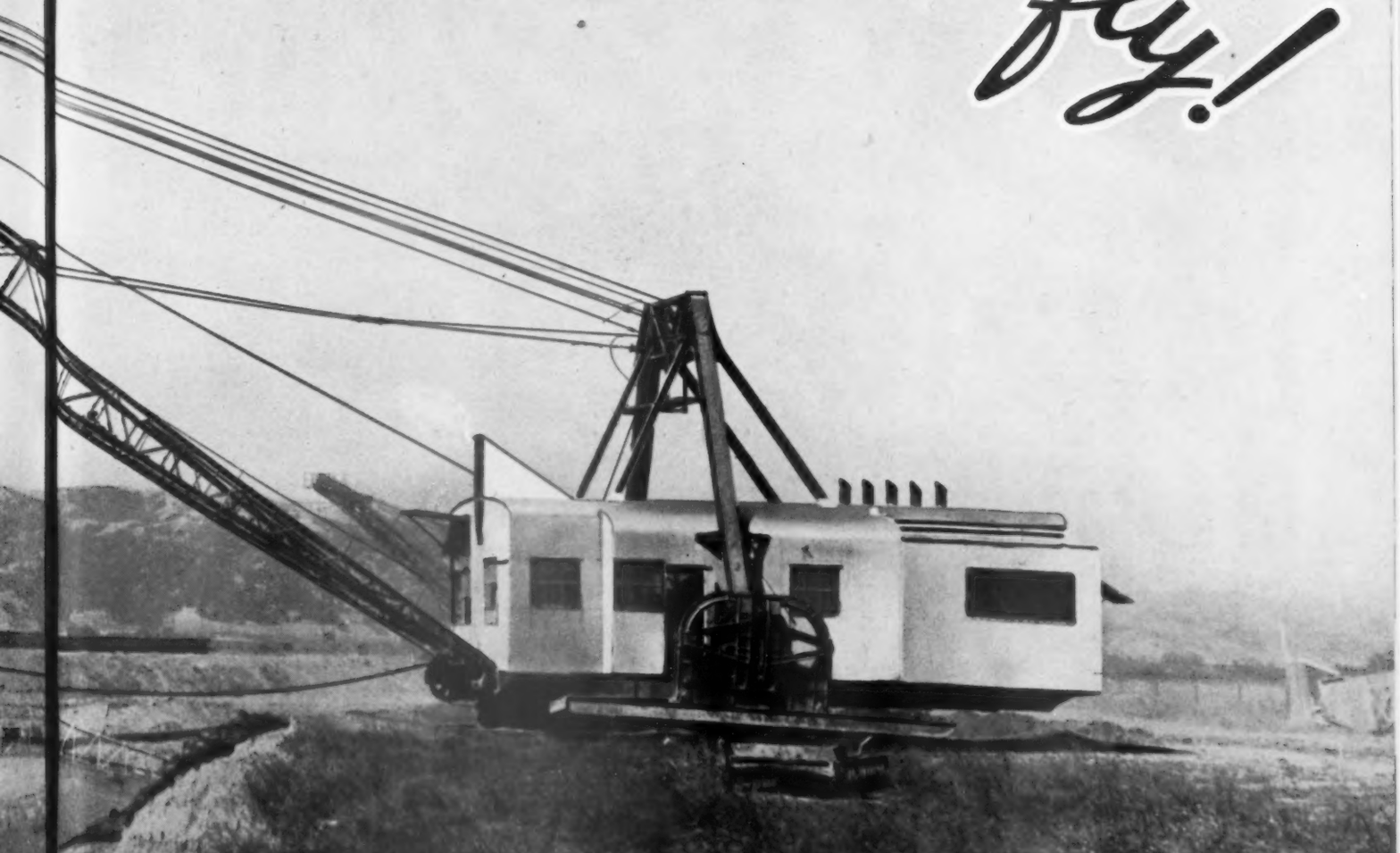
PB3

BUCYRUS-MONIGHAN

The Bucyrus-Monighan 5-W dragline illustrated operates at the Radum Gravel Plant near Oakland, California, for Henry J. Kaiser & Company.

BUCYRUS MONIGHAN

makes the dirt fly!



DIGGING wet or digging dry, the Bucyrus-Monighan Walking Dragline is always ready to deliver steady, big output at remarkably low costs. Rainy weather doesn't bother, nor need you waste money on pit drainage, for the Walker works high and dry on top of the bank. Long reach and quick fast swing plus big-capacity fast-digging bucket are coupled with low operating cost and steady dependable performance. Study the simplicity and strength of the design; note the big bearing area that permits working close to the edge of the bank, see how easily it moves stepping off in any direction away from slides or around obstructions. Investigate the Bucyrus-Monighan—there is a size to fit your dragline work. Manufactured by Bucyrus-Monighan Co., Chicago, Ill.

Sold by BUCYRUS-ERIE CO., SOUTH MILWAUKEE, WISCONSIN, U. S. A.

SHOVEL

CLAM SHELL CRANE

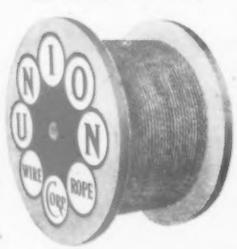
– PRE-FORMED ROPES SAVE MONEY

Because pre-formed rope has a slightly higher first cost, thousands of rope users have never thought of it as a money saver! Yet the fact is that in many services pre-formed costs substantially less, in the long run, than ordinary fabrication.

This is because pre-formed rope, being free from internal stresses, is much slower to fatigue under the combined stresses of constant bending. In service over small sheaves or wherever bending is severe, pre-formed will far outlast ordinary rope and effect a money saving.

"UNION-formed" Rope (our superior pre-formed product) should be used for hoist rope, crowd rope and rack rope on shovels; for holding and closing lines on clamshells; for hoist and digging ropes on trench hoes; for hoist and drag lines on drag-line machines; for hoisting ropes on cranes and derricks; all ropes for tractor-drawn wagon scrapers,—in short, wherever ropes are in constant operation over small sheaves or with reverse bends.

Union FORMED



"UNION-formed" Rope offers you an opportunity to definitely reduce your rope costs. Secure the expert recommendations of our nearest distributor.

UNION WIRE ROPE CORPORATION
General Offices and Factory: 21st and Manchester, Kansas City, Mo.
Chicago District Office and Warehouse, 431 West Pershing Road,
Telephone Yards 1659
Portland, Ore.: 2415 N. W. 22nd Ave.
In Mexico: E. O. Chapa, Calle Damas Sur 13, Tampico—Madero 2, Mexico D. F.
Export Agents: Lucey Export Corp. (Exclusive)
3505 Woolworth Bldg., N. Y. Broad St. House, London, E. C. 2, England
Distributors in Leading Cities throughout the Country

UNION WIRE ROPES

The ULTIMATE LOW COST WIRE ROPE

TRENCH HOE

MAGNET CRANE

IT CAN PACK UP AND MOVE IN A *jiboy*

"POWER BY THE TRUCK LOAD"—Although "Caterpillar" Diesel Engines are readily loaded, hauled and set up on location, this D17000 (160 horsepower) is directly mounted on truck. Belting it to the Pioneer 38V crushing plant which it drives, near Denver, Colo., is usually only a matter of minutes. Disconnecting and moving it elsewhere—to new location or to operating other equipment—is equally simple and time-saving. Plant averages 2500 tons per 21-hour day—during which time ★engine consumes only about 6 gallons of 8½c fuel per hour.

"Caterpillar" Diesel Engines are making portable crushing plants more and more popular and profitable because:

- *They are compact and easily moved with the rest of the outfit.*
- *They facilitate keeping operation close to both source of raw material and destination of finished product (making hauls shorter).*
- *They are the most economical power available.★*
- *They are durable and dependable—precision-manufactured of high-quality materials, and thoroughly protected by dust seals and positive lubrication.*
- *They require no specially trained attendant—any employee can quickly learn to look after their simple needs (no delicate adjustments or frequent check-ups).*
- *With normal care, they require little maintenance over long periods.*
- *They are backed by the most complete and widely established parts-and-service facilities of any engine in the world.*

"Caterpillar" Diesel Engines are adaptable to all kinds of equipment: Operating crushers, screens, washers; compressors for rock-drilling; shovels and bulldozers for removing overburden; cranes for loading; tractors and locomotives for hauling. *Nine sizes—32 to 160 horsepower.* See nearest "Caterpillar" dealer, or write us direct for further information.

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

CATERPILLAR DIESEL POWER

REG. U.S. PAT. OFF.

DIESEL ENGINES • TRACK-TYPE TRACTORS • ROAD MACHINERY

GIANT JANUARY ISSUE

PIT AND QUARRY'S 1939

Largest Net Paid Producer Circulation in the Industry

Closing Date December 24

COMPLETE COVERAGE

Every plant, every producer, every buying factor in the cement, crushed stone, sand and gravel, lime, gypsum and allied industries, will receive a copy of January PIT AND QUARRY—giving 100% coverage in the field.

OVER 6,700 CIRCULATION

In addition to its regular producer subscribers, there will be about 1,700 extra producer distribution, which, added to PIT AND QUARRY'S net paid producer circulation of more than 4,400, will bring the total producer distribution to more than 6,100 copies and the total circulation of this issue to more than 6,700.

CONVENTION DISTRIBUTION

January PIT AND QUARRY will be distributed to the attendants of the conventions of the crushed stone, sand and gravel, and ready-mixed concrete producers—when equipment purchasers are in a buying mood.

ANNUAL REVIEW NUMBER

January PIT AND QUARRY will contain a complete résumé of the past year's developments in methods, machines and materials—a wealth of valuable data for producers, engineers and purchasing agents.

NEW EQUIPMENT SECTION

A large section of January PIT AND QUARRY will be devoted to descriptions and illustrations of new equipment—a parade of mechanical progress—up-to-date information that every progressive operator will want to have.

This giant issue will be a reference number from cover to cover—a Yearbook with an "advertising life" far longer than that of any other issue—an advertising opportunity which you can not afford to miss.

RUSH Your Ad for Good Position

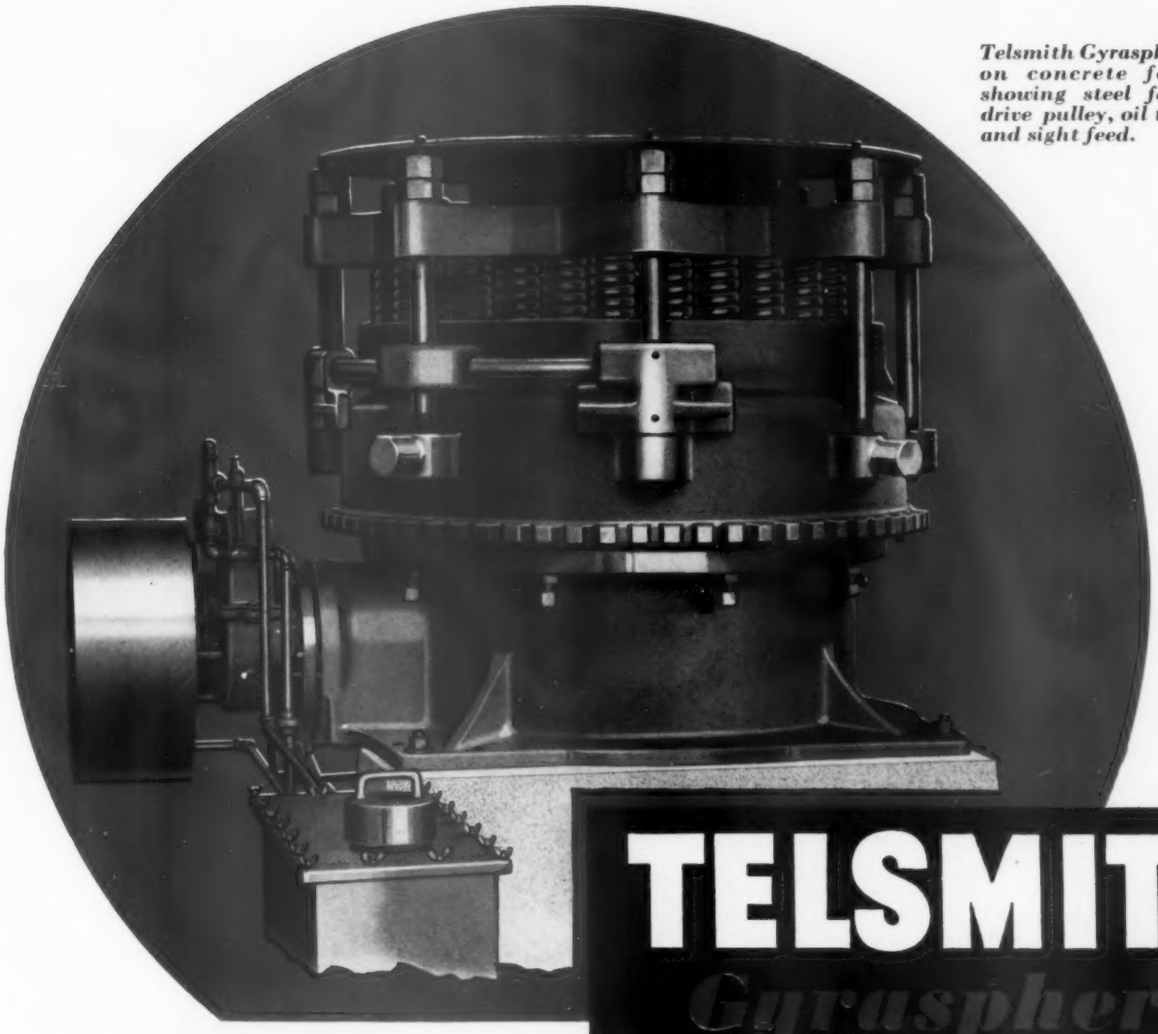
The early advertiser gets the choice space—so send your reservation at once, and let your copy come later.

Page rate $155.00 on annual contract.

Special Supplement Section on India Stock, $10.00 extra—puts your ad in a special forward position.

START YOUR 1939 CAMPAIGN with an advertisement in January PIT AND QUARRY—the best buy of the year.

PIT AND QUARRY 907 Rand McNally Bldg., CHICAGO



Telsmith Gyrasphere Crusher on concrete foundation, showing steel feed hopper, drive pulley, oil tank, piping and sight feed.

TELSMITH *Gyrasphere* CRUSHERS

GREATER TONNAGE . . . . .
MORE CUBICAL PRODUCT . .
FINER CRUSHING . . . . . .

with less trouble . . . less power . . . less upkeep

Here's a secondary crusher that knows its job—and has what it takes to do it.

It's as simple as that. All *you* have to do *for* the Telsmith-Gyrasphere is to set it for the size you want—ranging from ⅜″ to 1½″ with standard concave; or ⅛″ to ⅜″ with special concave.

Then bring on your rock—and let your conscience be your guide—excess feed means nothing to this baby. The Gyrasphere *can* . . . and does take it! Yes, sir—an unlimited, unregulated choke feed. *That means tonnage!*

When it comes to crushing, the Gyrasphere doesn't "crack down" on the rock. It *thrusts up.* The spherical head and its corresponding concave are like an *inverted* mortar and pestle. Rock is caught between two multi-curved surfaces—and *cubed.* That means an improved product with fewer oversize slabs and splinters.

We could write a book about the Gyrasphere. We have, but it's brief, interesting and gives all the facts. Mailed without cost or obligation. *Ask for Bulletin Y-15.* YC-12

Associates in Canada: Canadian Vickers, Limited, Montreal and Vancouver

50 Church Street New York City	211 W. Wacker Drive Chicago, Ill.	713 Commercial Trust Bldg. Philadelphia, Pa.	81 Binney St. Cambridge, Mass.	412 Westinghouse Bldg. Pittsburgh, Pa.
7016 Euclid Ave. Cleveland, Ohio	Abrams-Anderson Co. Detroit, Mich.	L. V. Fraley & Son St. Louis, Mo.	Brandeis M. & S. Co. Louisville, Ky.	Choctaw C. & M. Co. Memphis, Tenn.

SMITH ENGINEERING WORKS, 504 E. CAPITOL DRIVE, MILWAUKEE, WIS.

Last Chance to Catalog
Your Products.... Copy
Must be in Our Hands
by DECEMBER 15

Here's Your Market for 1939

Pit and Quarry HANDBOOK offers you 100% sales coverage for all of the coming year—a year that business leaders say will continue the sensational come-back for the heavy industries.

Housing programs, road building, land development projects and government construction on a huge scale, all point to an unprecedented demand for basic materials.

As the one and only Directory of all *producing plants* and *purchasing personnel* in the cement, gypsum, lime, sand, gravel and crushed stone fields, the HANDBOOK is the key to your advertising campaign.

List your entire line in this Buying Manual of the Pit and Quarry Industry—and your sales message will go to every prospect who authorizes or approves purchases in the 5,100 producing plants in the industry.

This is your logical market and your 1939 advertising will not be complete unless you include a page or series of pages in the HANDBOOK to catalog your products.

Act now, before the closing date of publication makes you miss your market.

PIT AND QUARRY PUBLICATIONS
538 SOUTH CLARK ST., CHICAGO

CONVENTION TIME IS COMING

....and here are the dates:

January 25, 26, 27

Twenty-Third Annual Convention
National Sand & Gravel Assn.
Netherland Plaza Hotel
Cincinnati, O.

Ninth Annual Convention
National Ready-Mixed Concrete Assn.
Netherland Plaza Hotel
Cincinnati, O.

•

January 30, 31, February 1

Twenty-Second Annual Convention
National Crushed Stone Assn.
Netherland Plaza Hotel
Cincinnati, O.

•

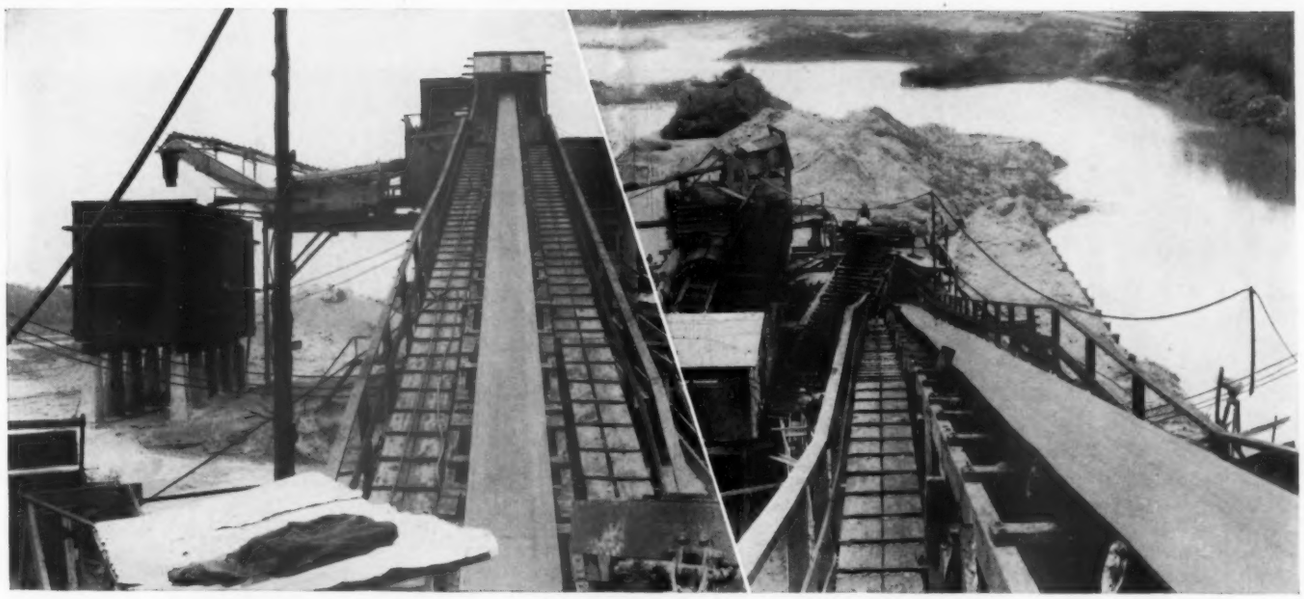
February 7, 8, 9

Nineteenth Annual Convention
National Concrete Masonry Assn.
Sherman Hotel
Chicago, Ill.

Concrete Industries Exposition
Sherman Hotel
Chicago, Ill.

Each year leaders of your industry gather to exchange views on the outstanding problems of the moment and of the future. The 1939 gatherings, listed at the left, again offer you the chance to profit through their educational value; you will, for a few days, enjoy the fellowship of those with problems similar to your own. And at each convention you will find an exposition of machinery and equipment which will point the way to improved operating methods, often at lower cost. The exhibits alone will be worth coming miles to see and to study.

Those in charge of convention arrangements have planned well. Some of the nation's leading authorities are to come and address you. Entertainment features will long be remembered. You will form valuable new contacts and worthwhile friendships. Plan now to attend one or more of these important gatherings. You will enjoy every minute of your stay and go home refreshed and inspired, equipped with new knowledge that will pay dividends. And, to avoid disappointment, make your hotel reservations early.



economical operation . .

THIS PLANT IS EQUIPPED WITH QUAKER Conveyor Belting

Continuous flow of materials . . . no stoppage or loss of time due to faulty rubber products at this gravel plant.*

It is in just such places that Quaker belts demonstrate their ability time and time again to show economy in operation.

The two views show a portion of the conveying unit. Our Crown Conveyor Belt is in use. 26" 5-ply construction, 375 feet long, having 1/8" top and 1/16" bottom cover and made with breaker strip. This belt is in steady operation conveying thousands of tons of loose gravel.

Quaker conveyor belts are custom-built. They are specifically made to fit the exact conditions where they are to operate. Utmost care is exercised in selecting the special woven duck. The rubber is compounded by experts. Only highly skilled workmen, under the guidance of experienced executives are employed. You get in the finished product a belt that will prove economical.

Call on Quaker's experienced engineers and belt experts. They can help you on any belt problem.

FOR ECONOMICAL OPERATION, SPECIFY QUAKER RUBBER PRODUCTS

* Name on request

QUAKER CITY RUBBER COMPANY

OVER 50 YEARS OF CONSISTENT QUALITY

PHILADELPHIA · NEW YORK · CHICAGO · SAN FRANCISCO

On a basis of ultimate cost· You'll choose GILMORE WIRE ROPE

In buying Wire Rope you pay only for service—nothing else. We have already recorded instances of service unlike anything heretofore accomplished with Wire Rope—all largely due to precision manufacture. When you buy Gilmore Wire Rope you may expect unusual service and when you get that—your rope cost has been materially reduced. Let us prove it.

Other J & L Steel Products:
Standard Pipe in seamless and welded—Seamless Steel Boiler Tubes—Hot Rolled Shapes—Abrasion Resisting Plates—Bar mill products including Bars for Concrete Reinforcement—Bar size shapes—Track Spikes—Wire Nails and Spikes—Galvanized Sheet Steel Roofing and Siding—Woven Wire Fencing—Barbed Wire—Soft Annealed Wire.

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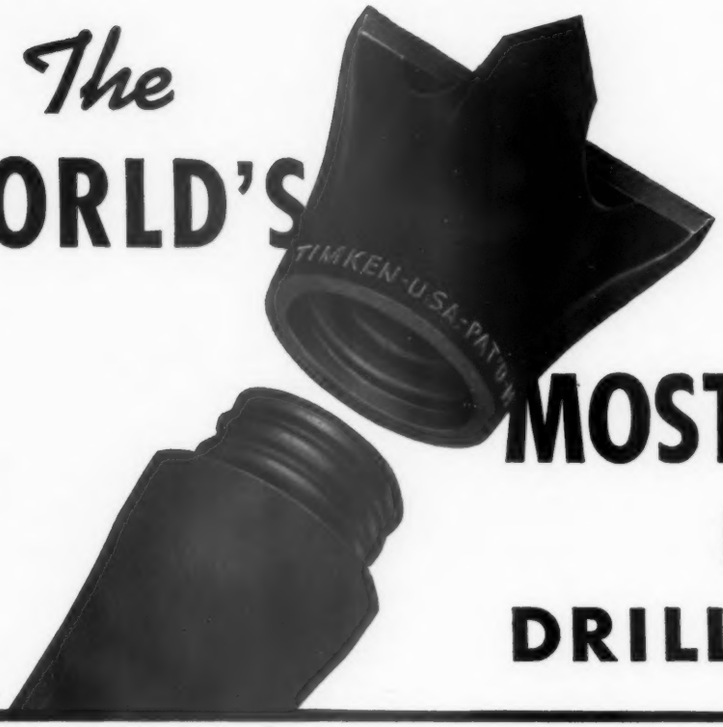
GILMORE WIRE ROPE DIVISION
MUNCY · PENNSYLVANIA

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH · PENNSYLVANIA

The WORLD'S



MOST EFFICIENT ROCK DRILLING TOOL

The TIMKEN Rock Bit has proved itself to be the best tool ever developed for drilling rock . . . on all counts . . . speed, life and economy. It drills faster because of its scientific design and shoulder construction. It lasts longer because it is made of TIMKEN Electric Furnace Steel *deep hardened* to resist abrasion and wear. It cuts drilling costs because in addition to the above advantages it eliminates forging expense, cuts nipping to the bone and radically reduces steel inventory.

TIMKEN Bearings are used on all locomotives and many of the cars of the new 20TH CENTURY LIMITED

Wherever TIMKEN Bits have been used they have invariably opened the eyes of the drillers, who have been quick to realize their possibilities and to take full advantage of them. As a result you will find your drillers' daily production of good holes steadily increasing.

Forged steels have had their day. Progress will have its way —hence, the increasing swing to TIMKEN Bits wherever rock bits are used. There's an Authorized Timken Rock Bit Distributor at the other end of your telephone.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

Manufacturers of TIMKEN Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; TIMKEN Alloy Steels and Carbon and Alloy Seamless Tubing; TIMKEN Rock Bits; and TIMKEN Fuel Injection Equipment.

TIMKEN
ROCK BITS

THERE MUST BE A REASON
FOR
CONTINUED POPULARITY

For nearly nine years Pit and Quarry has led all other papers in this field in subscriptions among producers. It is the most popular paper —with its popularity constantly growing, as is shown by the increasing number of subscriptions and the increasing margin of lead.

The reason? At no time has Pit and Quarry compromised with its high editorial standards. It has held its editorial staff, and kept its field editor on the road, wearing out a car in one to two years. The illustrations have always been plentiful, the articles easy to read.

Costly to do this? Yes, it is. But it has been worth the cost, for producers realize that Pit and Quarry has worked *with* them. Savings effected by change from biweekly to monthly publication have been passed on in the form of a reduced subscription price—not pocketed. And the high percentage of subscribers who renew their subscription attests their loyalty to a publication understanding their problems and working *with* them.

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THE 3/4 YD. LORAIN-40 IS TOUGH AND TALENTED

There's nothing frail about the 3/4-yd. Lorain-40. This shovel of the U. S. Lime Products Corp., Sloan, Nevada, works out daily against a 100-ft. face and the tonnage it produces more than meets production requirements.

In performance the Lorain-40 is just a small-size edition of the famous 1 1/2-yd. Lorain-77. Its power, speed, and strength exceed those of other machines of equal capacity because it is built to Center Drive design. You don't have to pamper a Lorain-40 in rock digging—just give this shovel its head and you'll move plenty of material quickly and cheaply.

The "40" is as talented as it is tough, too. Through the use of interchangeable booms, this shovel can be easily converted into an efficient clamshell or dragline. Whether it is stripping, stockpiling, truck loading, or clean-up job—the Lorain-40 is always ready to step in and go to work.

Write today for catalog describing the 3/4-yd. Lorain-40. It's the biggest small shovel and crane value ever offered.

UNIVERSAL CRANE DIVISION
THE THEW SHOVEL COMPANY
LORAIN, OHIO

THEW CENTER DRIVE
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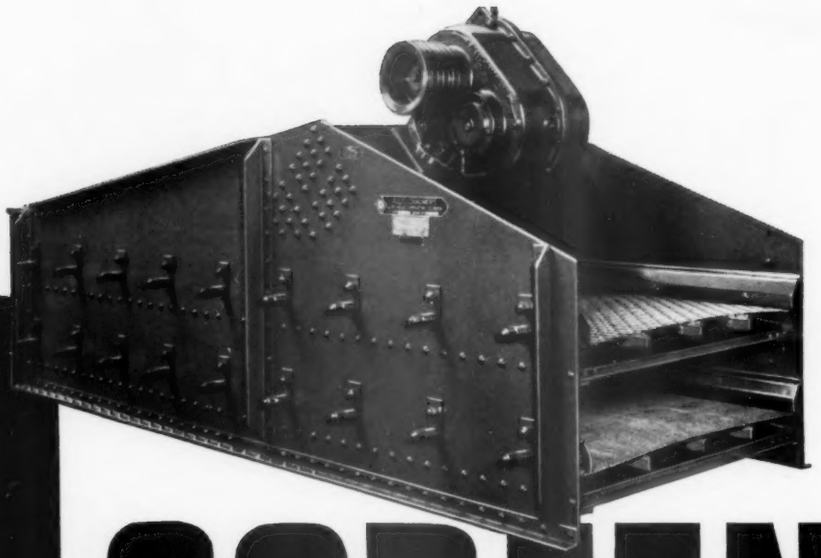
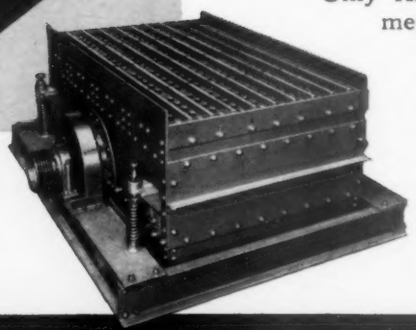


19 SCREENS in one plant



AND EVERY ONE CUTTING PRODUCTION COSTS!

No one screen can handle all sizing jobs. You can't keep costs down, unless each screen pays its way — doing the work for which it was built.

That's what a prominent automobile manufacturer found. Now, on the recommendation of Allis-Chalmers engineers, he's cutting production costs with four distinct, basic types of screen! Actually, there are 19 Allis-Chalmers screens, performing many services, in his plant.

Only Allis-Chalmers can make an impartial recommendation to you on screening problems. For Allis-Chalmers alone builds eight types of screen, each designed to do a particular type of job efficiently and economically.

And there's no screening problem, large or small, that can't be solved by Allis-Chalmers engineers. They're ready to put a wealth of technical experience to work to help you on cutting your costs!

928

ELECTRICAL AND MECHANICAL VIBRATING SCREENS • ROTATING SCREENS • STATIONARY AND ACTIVATED GRIZZLIES • CRUSHING, WASHING, AND METALLURGICAL MACHINERY

CRUSHING · CEMENT AND MINING DIVISION

ALLIS-CHALMERS

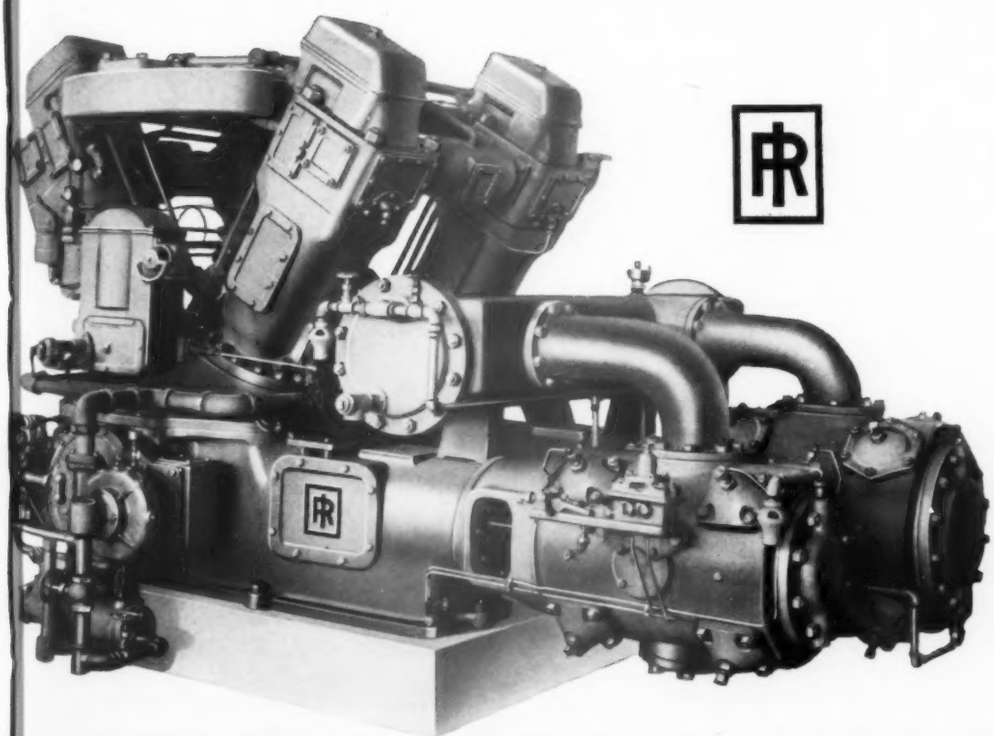
MILWAUKEE · WISCONSIN

933 CU. FT. OF AIR for 1¢

*For every cent spent for fuel oil the XVO will compress 933 cu. ft. of free air to 100 pounds pressure.

*Based on fuel oil at 6 cents per gallon.

The New XVO Diesel-Engine-Driven Compressor



THIS new compressor combines a *heavy-duty, four-cycle Diesel engine* and a *horizontal heavy-duty, double-acting compressor* in a single, compact and comparatively light-weight unit which operates at a moderate speed. High over-all efficiency is the natural result of such a unit. It is the outstanding Diesel-driven compressor of today.

This compressor is built in sizes of 4, 6, or 8 power cylinders, rated respectively at 625, 935 and 1250 cfm. actual free-air capacity at 100 pounds pressure. Compressor cylinders can be furnished for vacuums, for pressures up to 5000 pounds, and for air, gas or ammonia compression.

The frame, running gear and compressor cylinders are the same as for our Type XVG gas-engine-driven unit of which there are more than 125,000 installed horsepower. The fuel and combustion systems of the XVO are the same as those of the Ingersoll-Rand Type S Diesel engine, a pioneer in its field.

The XVO is conservatively rated for 24 hours-a-day, full-load service. When economy dictates the use of Diesel engines, the XVO compressor is the logical choice.

More detailed information on its money-saving features is contained in Bulletin 3072. May we send you a copy?

I-R Products: Compressors, Rock Drills, Pneumatic Tools, Oil Engines, Pumps, Condensers, Refrigerating Units

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YOU CAN STRIP IT CHEAPER

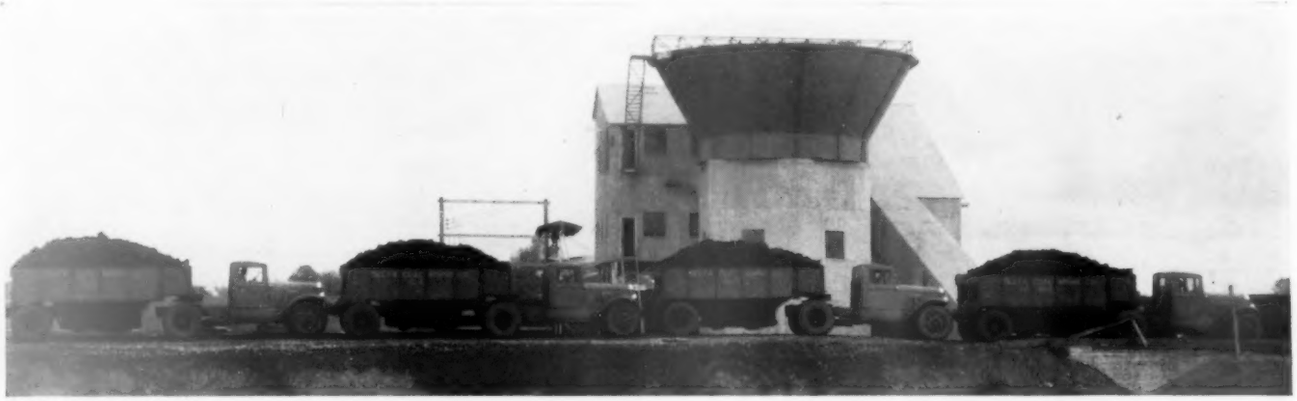
With Sanford-Day's
Automatic Bottom-Dumping Trailers

STRIP YOUR COSTS AS YOU STRIP YOUR OVERBURDEN

Study the illustration above. It shows you how the famous S-D principle of bottom discharge mine cars has been adapted to S-D rubber tired trailers. Doors are tripped automatically as the trailer reaches the hopper or storage bin . . . then closed automatically as the trailer leaves the bin . . . both operations accomplished solely by the travel of the trailer across the bin . . . no manual labor whatsoever. Here, we have given you the whole story in a nut-shell . . . actual operation is as simple as telling about it. This simplicity . . . absence of all tricky gadgets . . . no loss of time . . . sturdy construction for heavy service, and easy, fast manipulation are reasons why S-D Trailers are cutting hauling and dumping costs for many operators.

S-D Trailers are built in 6 to 50 Ton capacities, all of which have a very low center of gravity, due to their particular design. If you have any idea that S-D Trailers might save you money, let one of Sanford-Day's engineers tell you what they are doing for others, and why.

NOTE . . . Here are four 16 ton S-D Automatic Bottom Dump Trailers in operation at an Illinois plant. They have hauled and dumped over 2700 tons in a 7 hour day.



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MINE CARS, ALL TYPES — TRAILERS — WHEELS — SHEAVES

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PIT AND QUARRY

Vol. 31 December, 1938 No. 6

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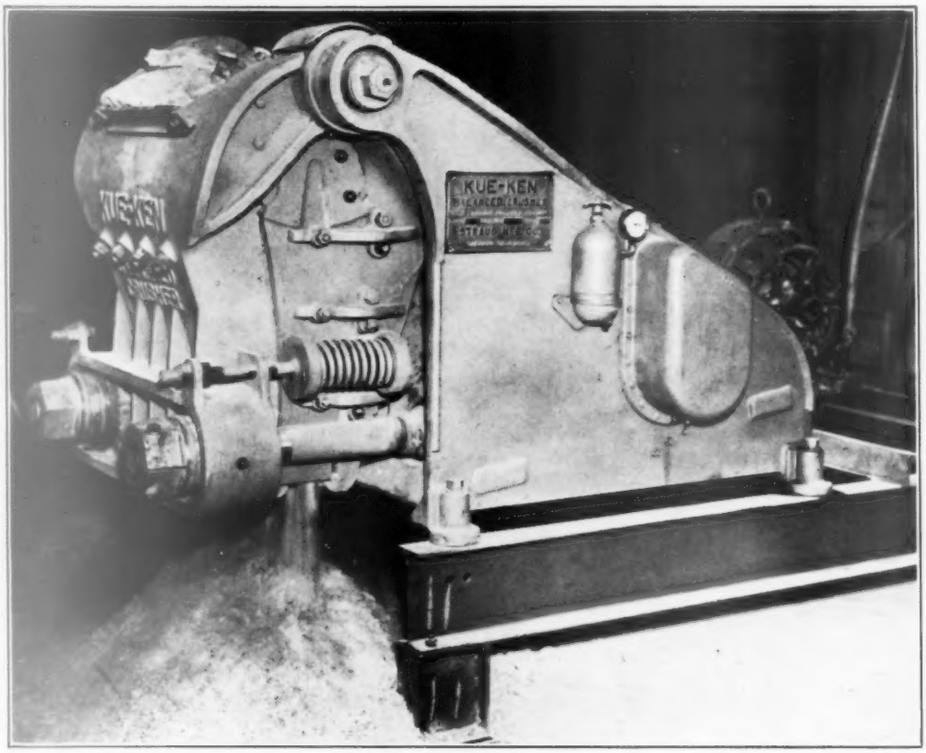
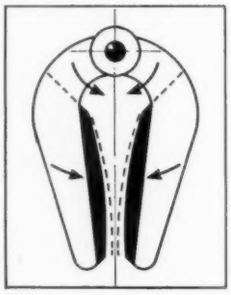
KUE-KEN BALANCED CRUSHER

A STARTLING MODERN MACHINE · DEVELOPED BY A COMPANY WITH 40 YEARS EXPERIENCE BUILDING GOOD REDUCTION EQUIPMENT. THE **KUE-KEN** BALANCED CRUSHER REDUCES ROCKS FASTER AND FINER THAN EVER BEFORE—AND DOES IT *WITHOUT ABRASION!*



An un-retouched photo of a No. 50 Kue-Ken balanced crusher in action. This crusher is fastened to a temporary light steel frame which is not bolted to the floor, proving the perfect balance.

Notice the large chunks of quartz at the mouth of the jaws. These weigh as much as 90 lbs. each, the smallest 30 lbs. They are being crushed to ⅛" jaw setting at the rate of 13 tons per hour, using 40 HP. With 3" jaw setting, the capacity is 60 tons per hour with 15 HP. And all this—without abrasion! No other crusher can equal it.



The Kue-Ken crushing principle—see the arrows. A pair of free swinging, balanced pendulum jaws pivoted at the top. They move together and downward with the rock stream, no rubbing against each other. They crush without abrasion.

Some exclusive advantages:

1. No abrasion, minimum wear.
2. Ability to crush large rocks very fine in a single pass.
3. Low power requirements.
4. Perfect balance eliminates massive foundations, permits truck mounting.
5. Jaw setting instantly adjustable.
6. Reliable safety device against tramp iron.
7. Sealed mechanism in filtered oil bath.
8. Rugged all-steel construction, minimum weight and portability.
9. Low headroom and small floor space.
10. Moderate cost gives most crushing capacity for your dollar.

SEND TODAY FOR BULLETIN 600

We also manufacture Rib-cone ball mills, tables, trommels, vibrating screens, feeders, ore bin gates, etc. Bulletin No. 302.

STRAUB MFG. CO.

528 CHESTNUT STREET OAKLAND, CALIF.

PIT AND QUARRY

CHICAGO DECEMBER, 1938

Agstone Men Discuss Sales, Market Topics

GATHER AT FRENCH LICK, IND.

Twelve producers gathered to discuss selling practices and market conditions at the regular annual meeting of the Midwest Agricultural Limestone Institute, held at French Lick, Ind., October 28.

E. J. Krause, president of the association, appointed a Standards Committee, consisting of J. R. Bent (chairman), W. H. Carter, H. A. Clark and Norman Kelb to study methods of sampling stone in quarries producing agricultural limestone and asked it to make its report before a coöperative contract with the Illinois Agricultural Assn. is signed.

On the recommendation of the Nominating Committee the following officers and directors were elected:

President, E. J. Krause; vice-president, J. L. Fay; treasurer, George H. Hert (Newton County Stone Co.); secretary, Dan Sanborn.

Directors: *Northern District,* H. A. Clark and J. L. Fay; *Eastern District,* Norman Kelb; *Southern District,* E. J. Krause and George Rippetoe (Anna Quarries, Inc.); *Western District,* E. S. Lockhart (Marblehead Lime Co.); *Central District,* Dan Sanborn.

The following members and guests were present:

J. R. Bent, Dolese & Shepard Co., Chicago, Ill.

W. R. Carter, National Stone Co., Joliet, Ill.

H. A. Clark, Consumers Co., Chicago, Ill.

George Enfield, Purdue University, Lafayette, Ind.

J. L. Fay, Moulding-Brownell Corp., Chicago, Ill.

Samuel C. Hadden, Indiana Mineral Aggregates Assn., Indianapolis, Ind.

H. M. Hollingsworth, Ohio & Indiana Stone Co., Indianapolis, Ind.

Norman Kelb, Ohio & Indiana Stone Co., Indianapolis, Ind.

E. J. Krause, Columbia Quarry Co., St. Louis, Mo.

J. E. Lamar, Illinois Geological Survey, Urbana, Ill.

C. M. Linsley, University of Illinois, Urbana, Ill.

L. M. Long, Bedford Stone Products Co., Bedford, Ind.

R. W. Meisinger, Hy-Rock Products Co., Evansville, Ind.

Stanley A. Phillips, PIT AND QUARRY, Chicago, Ill.

N. C. Rockwood, *Rock Products,* Chicago, Ill.

Dan Sanborn, Lehigh Stone Co., Kankakee, Ill.

John R. Spencer, Illinois Agricultural Assn., Chicago, Ill.

Weir Traver, Elmhurst-Chicago Stone Co., Elmhurst, Ill.

E. D. Van Clive, Ohio & Indiana Stone Co., Indianapolis, Ind.

Dr. Voskuil, University of Illinois, Urbana, Ill.

Oklahoma Portland to Install Dust Arrestors

Contracts are reported to have been let by the Oklahoma Portland Cement Co. for the installation of dust arrestors at its plant at Ada, Okla.

Coming Events

January 25-27, 1939, Cincinnati, O. — Annual conventions, National Sand & Gravel Assn. and National Ready-Mixed Concrete Assn., Netherland Plaza Hotel.

January 30, 31-February 1, 1939, Cincinnati, O. — Annual convention, National Crushed Stone Assn., Netherland Plaza Hotel.

February 7-9, 1939, Chicago, Ill. Annual conventions, National Concrete Masonry Assn., American Concrete Contractors' Assn. and Concrete Industries Exposition, Hotel Sherman.

February 23-25, 1939, San Francisco, Cal. Annual convention, American Concrete Pipe Assn.

March 7-10, 1939, San Francisco, Cal. Annual convention and show, American Road Builders' Assn., Civic Auditorium

Indict 16 Aggregates Firms in New Jersey

CHARGE FRAUD IN W.P.A. SALES

Sixteen firms alleged to have formed a sand and stone "trust" and 32 persons have been indicted on conspiracy charges by a Federal grand jury at Newark, N. J. The indictments charge the defendants participated in a plot by which the government was defrauded out of $250,000 in less than a year on purchases of road materials for W.P.A. projects in Essex, Bergen and Passaic Counties, in New Jersey.

The defendant companies are charged with having a practical monopoly on the aggregates business in their counties and with fixing a price of approximately $2 per cu.yd. for sand and $3 a cu.yd. for crushed stone for W.P.A. road projects. These prices, it is charged, were in excess of those made to dealers and contractors for other work.

The indictment also charges that a number of the defendants were interested in the Passaic County Quarry Assn., which is alleged to own an unoperated quarry in Totowa, N. J. In submitting bids on W.P.A. projects, the charges declare, the defendants used the name of the association and if it were awarded a contract, it would be divided up among several of the defendants.

It is alleged the prices fixed by the defendants were greatly in excess of those warranted by the market or other conditions and that they were fixed to prevent open bidding on the projects in the three counties concerned.

The firms, all located in the three counties, are named in the indictment as A. D. McKee, Inc.; Samuel Braen's Sons, Inc.; George M. Brewster & Son, Inc.; Brooks & Wright, Inc.; Burton Canfield, Inc.; Harrison Supply Co., Inc.; Mulroy Cooke, Inc.; Orange Quarry Co., Inc.; Consolidated Stone & Sand Co.; Great Notch Corp.; Little Falls Sand & Gravel Co.; Newark Sand Co.; Passaic Transit Concrete Co.; Paterson Crushed Stone Co.; Tidewater Stone & Sand Co., and Union Building & Construction Co.

Missouri Holds First Minerals Conference

JOHN PRINCE MADE CHAIRMAN

The first Mineral Industries Conference in Missouri was held on the campus of the School of Mines and Metallurgy at Rolla, Missouri, on Oct. 21 and 22, the meeting being called at the instance of Dr. William R. Chedsey, director of the School of Mines and Metallurgy, and Dr. H. A. Buehler, head of the Missouri Geological Survey. The purpose of the meeting was to acquaint the mineral industries of Missouri with the facilities which the service bureaus of the state and federal governments maintain in Missouri—the Missouri School of Mines and Metallurgy with its Experiment Station, the State Geological Survey, and the Mississippi Valley Experiment Station of the United States Bureau of Mines.

C. M. Butler of the Marquette Cement Mfg. Co. spoke on the technical problems of the cement industry, following which Dr. H. A. Buehler of the Missouri Geological Survey, Dr. R. S. Dean, chief metallurgist of the U. S. Bureau of Mines and Dr. William R. Chedsey of the Missouri School of Mines outlined the facilities which these various service institutions had available for the solving of the problem in which the industries of the state are interested.

On the evening of October 21 the conference met in a joint dinner session with the St. Louis Section of the American Institute of Mining and Metallurgical Engineers and the Tri-State Section of the same organization. The principal address of the evening was by Dr. D. C. Jackling, President of the American Institute of Mining and Metallurgical Engineers and an alumnus of the School of Mines and Metallurgy. Dr. Jackling's talk was limited to his experiences in Rolla and the benefits to the younger engineers through association with the Institute.

Dr. M. M. Leighton, chief geologist of the Illinois Geological Survey, who was in attendance at the conference, described the arrangement developed in Illinois in its mineral industries organization and the benefits which both the industry and the survey there had received from such an organization. He suggested the formation of a similar organization in Missouri.

John Prince, president of the Stewart Sand & Material Co., Kansas City, Mo., read a paper on the technical problems of the sand-and-gravel industry of Missouri. He stated that the presence of chert both in the eastern gravel and the eastern limestone of Missouri creates one of the technical problems in that part of the state as no mechanical method has been found for the removal of this material and it must be picked out by hand or a new source of material found. Also, the question of gradation is becoming of first importance. Many years ago, he stated, sand was sand, but with the development of the Missouri Highway Department and more knowledge of concrete the importance of gradation became known.

B. D. Reynolds of the Independent Gravel Co., of Joplin, Mo., spoke on the tripoli, chat and limestone industries of Missouri, following which W. H. Comins of the National Lead Co., St. Louis, spoke on barytes. Mr. Comins told of the difficulty his company was having in the production of barytes in Washington County, and in trying to keep the people there employed working in competition with other barytes regions where the industry is largely mechanized.

Growing out of the conference was the organization of a committee of thirty representatives of the mineral industries, public utilities, the railroads and the state government, to bring about closer relationship between these industries and the service organizations maintained by the state.

John Prince of the Stewart Sand & Material Co., of Kansas City, was appointed chairman of an organization committee composed of himself and W. M. Weigel, mineral technologist of the Missouri Pacific Railroad Co., St. Louis, and G. C. Smith, assistant to the president, Missouri, Kansas & Texas Railroad Co., St. Louis. The permanent organization is now being formed.

To Pulverize Limestone from Indiana Quarry

Through arrangements with the Indiana Limestone Co., Bloomington, Ind., one of the leading producers of dimension stone for building purposes, waste stone is to be turned into agricultural stone and pulverized limestone on a large scale shortly after the first of the year at a Bloomington plant to be operated by the Thompson & Weinman Co. of Cartersville, Ga.

Machinery, including crushing, grinding and separating equipment, is now being installed and the initial output is expected to be around 100 tons daily.

J. J. McEvers, engineer of the Thompson & Weinman firm, is supervising the erection and equipping of the new plant. The company at present produces chats, mica, barites and other materials at four plants located in Cartersville, Sparta, Tenn., Norristown, Pa., and Waltham, Mass.

Cement Earnings on Decline, Reports Say

LONE STAR HOLDING UP WELL

The report of the Lone Star Cement Corp. for the quarter ended September 30, 1938, subject to audit and year-end adjustments, shows consolidated net profit of $805,585 after depreciation, depletion, Federal income taxes, provision for contingencies, etc., equal to 84 c. a share on 962,228 shares of capital stock. This compares with $1,206,189 or $1.25 a share on 967,095 shares in the September quarter of the previous year, and $797,134 or 83 c. a share on 961,641 shares in the quarter ended June 30, 1938. For the nine months ended September 30, net profit was $2,328,956, equal to $2.42 a share on 962,228 shares, comparing with $3,130,627 or $3.24 a share on 967,095 shares for the nine months ended September 30, 1937.

The Lehigh Portland Cement Co. report for the 12 months ended September 30, 1938, shows net profit of $487,232 after Federal income taxes, depreciation, depletion, obsolescence, etc., equal, after deducting $227,004 dividends paid on 4-per cent. convertible preferred, to 34 c. a share on 754,434 shares of common outstanding at the close of the period. This compares with net profit for the 12 months ended September 30, 1937, of $1,289,928, equal, after deducting $279,473 dividends paid on preferred, to $1.34 a share on 754,430 common shares.

The Calaveras Cement Co. has declared a dividend of $1 a share on preferred stock, payable November 1 to stock of record October 25. Payment applies on arrearage, which will amount to $13.25 a share after the November 1 disbursement.

The North American Cement Corp. reports for the 12 months ended September 30, 1938, net loss of $882,334 after taxes, depreciation, depletion, interest, etc., but before profit on bonds acquired, against net loss of $484,828 for the 12 months ended September 30, 1937.

For the 12 months ended September 30, 1938, the Pennsylvania-Dixie Cement Corp. shows a loss of $43,213 compared with a profit of $104,244 for the year ending September 30, a year ago.

Supplies Bituminized Material for Streets

The Dawes Silica Mining Co., of Thomasville, Ga., is supplying cold-mixed bituminized aggregates for the paving of a number of Thomasville streets.

Marquette Plan Aids Security of Workers

PROVIDE RETIREMENT ANNUITY

The Marquette Cement Mfg. Co. has put into effect a supplemental private pension plan for its employees. This plan was adopted, according to W. A. Wecker, president, in order to provide rates of pensions, for employees earning $3,000 per year and over, more nearly in line with the rates presently provided under the Federal Social Security Act for employees earning less than $3,000 per year.

The Federal plan now provides for pensions to all employees based on earnings up to $3,000 per year. The effect of this is that an employee's pension remains stationary at $3,000 regardless of his earning rate, thus creating a disparity between high and low salary classifications with a decidedly less favorable treatment of the higher salary group.

The new Marquette plan seeks to level out this disparity by providing supplemental pensions which, together with the Federal benefits, will produce pension rates more nearly approaching those in the less than $3,000 category.

Essentially the new plan provides for retirement annuity based on future service. The amount of the monthly pension payable from normal retirement date arising from future service will be the total of the separate monthly units of retirement annuity accumulated for each year the employee remains a contributor to the plan.

The administration of the plan, in order to give assurance of safety and security, has been placed in the hands of the Metropolitan Life Insurance Co.

Kaolin Producer Awards Contracts for Plant

The California Kaolin Co., Robert Killefer, president, which has had a new plant site under consideration at Lone Pine, Cal., for some time has decided to locate instead at Cartago, Cal.

Contracts for the new building have already been awarded.

Cite Milwaukee Dealers for Alleged Conspiracy

Unlawful restraint of trade and suppression of competition in the sale of building supplies shipped between Wisconsin and other states is alleged in a complaint issued by the Federal Trade Commission against 11 Milwaukee building-material dealers.

The respondents' practices are alleged also to have the effect of substantially and artificially increasing and maintaining the prices at which building supplies are sold to purchasers and consumers in Milwaukee County and other counties in Wisconsin and of depriving such purchasers and consumers of the benefits of fair, free and normal competition.

Employment, Payrolls Both Show Declines

According to Isador Lubin, commissioner of labor statistics of the U. S. Department of Labor, both employment and payrolls declined in September in the cement, quarrying and nonmetallic-mining industries, as compared with August.

In the cement industry, the drop was 2.6 and 3.0 per cent. respectively for unemployment and payrolls while for quarrying and nonmetallic-mineral mining employment was down only 0.1 per cent. and payrolls 2.6 per cent.

Chemical Society Medal Presented to Dr. Dorr

The medal of the Society of Chemical Industry was presented to Dr. J. V. N. Dorr, president of the Dorr Company, Inc., at a joint meeting of the American Section of the Society of Chemical Industry and the American Chemical Society on November 4, 1938. The medal is awarded annually for valuable application of chemical research to industry.

The medal was given this year to Dr. Dorr in recognition of his inventions and subsequent world-wide introduction of apparatus and processes in many chemical, metallurgical and mining operations which have made possible low-cost production on a large scale.

The North Bangor Slate Co. plans construction of a slate plant in Bangor, Pa., to cost about $45,000.

Cement Prices Slide Lower in California

BASE MILL QUOTATIONS AT $1.15

Resumption of the Southern California cement-price war, which has been quiet for more than a year, was reported recently when mill base prices were reduced 16 c. a bbl. and bids were cut as much as 25 c. The drop in cement prices is understood to have followed a price war among sand-and-gravel producers and a cut in cement prices for delivery in southern San Joaquin Valley points.

The result of the Southern California cement-price reductions was to send base mill prices as low as $1.15 a bbl., a level at which producers are certain to be operating at or near a loss.

Price of cement in San Joaquin Valley points was revised last week through adoption of a zone delivery basis in place of the former mill base. Under the old mill base, cement prices were quoted at the mill, with freight to destination added. Under the zone basis, mills are reported to have set flat barrel prices for delivery to any point within fairly large zones. This method is now reported to have reduced cement prices in the valley area by about 30 c. a bbl.

Fire Causes Huge Loss at Kansas City Quarry

Fire caused damage estimated at $45,000 recently when it swept the plant of the Byer Crushed Rock Co. at 95th and Holmes Sts., just outside Kansas City, Mo.

Being outside the city limits the plant was without fire protection, the Kansas City department having been notified of the blaze, but refused to make the run.

Ruins of the Byer Crushed Stone Co. plant after the fire.

Public Construction Highest in 3 Years

IMPORTANT FACTOR IN MARKET

Public and institutional buildings have again become an important factor in the rising building market, according to F. W. Dodge Corp. During the month of October, contracts were awarded in the 37 eastern states for $89,839,000 worth of buildings in these classifications, their largest volume since December 1935. Compared with the total for October, 1937, which was $35,085,000, the increase was nearly 156 per cent. These classifications include educational buildings, hospitals and institutions, public administrative buildings, social and recreational projects, and religious and memorial buildings.

Recent renewed activity in these classes of non-residential buildings, stimulated by the current P.W.A. program, brought the total of contracts let for such projects during the first ten months of 1938 up to $502,407,000, compared with $423,117,000, in the corresponding period of last year, an increase of 19 per cent. The dollar volume of contracts for hospitals and institutions has run 35 per cent. ahead of last year; social and recreational projects have run 27 per cent. ahead; educational buildings, 26 per cent. ahead. Contracts for public administrative buildings (post offices, city and town halls, fire and police stations, and the like) have lagged 7 per cent. behind 1937, and religious and memorial buildings, which are largely financed by private subscriptions, have lagged 2 per cent. behind. In the total of publicly financed non-residential construction for which contracts were let in the first ten months of 1938, 32 per cent. has been for buildings and 68 per cent. for heavy engineering construction.

Continued increase in contracts for public non-residential building contracts is indicated for some months to come. From January through October, the Dodge organization has reported contemplated projects in these classifications to the amount of $1,667,000,000, or three times the volume of contracts awarded during the same period, and more than double the volume of contemplated projects reported during the first ten months of 1937. The volume of new plans customarily increases when a new Federal works program is announced. A large proportion of them represent needed, but postponable, projects. The volume of contracts to be let in a given time is, therefore, determined more largely by the amount of Federal funds available than by the combined totals of planned projects, but the accumulation of contemplated public projects tends to create a back-log of demand, some of which is met by local municipal financing after allocations of Federal funds have been completed.

Operators Organize to Fight Ban on Product

Aggregates producers in Ventura County, California, have joined in a fight to compel the state department of architecture to accept their product for use in public works.

According to reports, following a couple of structural failures in Santa Barbara County the state made tests of aggregates in the Santa Clara River basin in Ventura County and has since turned "thumbs down" on the product. According to the producers, the tests should apply only to concrete aggregates used under extreme conditions of temperature, which do not exist in Ventura County and vicinity.

Recent Equipment Installations ★ ★ ★

Four Buffalo double-deck vibrating screens were recently installed in the new washing plant of the John E. Redman Sand & Gravel Corp., Rochester, N. Y. . . . *The Troy Slag Products Co., Troy, N. Y., has installed a New Holland roll crusher and a Trowbridge vibrating screen.* . . . Kennedy gyratory reduction crushers have just gone into service at the Stiles Quarry, Greenwich, N. Y., and at the sand-and-gravel plant of Lattanzio Bros., Glenville, N. Y.

An Allis-Chalmers rod mill has been installed at the La Grange, Ill., quarry plant of the Moulding-Brownell Corp. of Chicago. . . . *A unique crusher, 36 in. by 60 in. in size, has been sold by the Birdsboro Foundry & Machine Co. to the Asbestos Corp., Ltd., for installation at Thetford Mines, Quebec.* . . . The Diamond Portland Cement Co. recently placed a 20-ton Plymouth locomotive in service.

The Worden Sand & Gravel Co., Bedford Hills, N. Y., recently placed its fourth Cummins Diesel-powered truck in operation. . . . *A Raymond Whizzer mill has been installed at the Hannibal, Mo., plant of the Marblehead Lime Co.* . . . Badly damaged by the recent hurricane which created havoc in New England, the West Roxbury Trap Rock Co., West Roxbury, Mass., has installed $15,000 worth of new equipment to replace that lost or damaged by the storm. . . . *A new Butler batcher and bins and two new Chain Belt Rex truck-mixers on Autocar chassis were included in recent equipment installations made by the Dauphinais Sand & Gravel Co., North Grafton, Mass.* . . . A Kennedy sand classifier and new Blaw-Knox batching and weighing equipment are being installed by the Western Massachusetts Sand & Gravel Co. at its Westfield, Mass., plant.

The new vibrating screen in the Lancaster, N. Y., plant of the Buffalo Sand Co. is a Seco 4-ft. by 12-ft. triple-deck unit manufactured by the Screen Equipment Co., instead of a Niagara as reported in this column in the November issue.

N.R.M.C. Assn. Will Develop Wage Data

TO SEEK COMPLIANCE WITH LAW

Under the Walsh-Healey Act the Secretary of Labor is instructed to determine prevailing minimum wages in each of the industries which customarily sell materials and equipment to agencies of the Federal government. When there has been a formal finding by the Secretary in this regard, the contracting firms in the respective industries must thereafter agree to pay not less than the prevailing minimum wages so determined, in the execution of any contract with an agency of the Federal government where the value of the contract exceeds $10,000. Until there has been a formal finding of the prevailing minimum wages in the industry involved, that part of the act is inoperative.

Between September 28, 1936 and August 18, 1938, contracts for ready-mixed concrete entered into with agencies of the Federal government under the Walsh-Healey Act, totalled $2,538,684. Such contracts involved compliance with the 8-hr. day and the 40-hr. week, with time and one-half for overtime, which are specifically stipulated in the statute, but since there has not been a determination by the Secretary of prevailing minimum wages in the ready-mixed-concrete industry, those members of the industry having contracts subject to the Walsh-Healey Act have not been required to comply with any minimum wage determinations.

At the request of L. Metcalfe Walling, administrator of the Walsh-Healey Act, a committee representing the ready-mixed-concrete industry met with him and his associates in Washington on October 14. Mr. Walling stated that the department was preparing to make a determination of prevailing minimum wages in the ready-mixed-concrete industry, and asked for the coöperation of the National Ready Mixed Concrete Assn. in the development of information upon which a finding by the Secretary could be based.

It was agreed at the meeting that the National Ready Mixed Concrete Assn. should be designated as the agency to develop the necessary data. With the knowledge of the Department, therefore, the association has sent to each ready-mixed-concrete company of whom it has record, irrespective of the question of association membership, a questionnaire asking for the necessary data.

The George Pettinos Sand Co. has erected a new loading plant for silica sand at Millville, N. J.

5½-Month Strike of Lime Workers Ends

SIGN CLOSED-SHOP AGREEMENT

After a strike lasting five and one-half months, the Bluff City lime plant of the Mississippi Lime Co., Alton, Ill., located in the Ste. Genevieve, Mo., producing district, signed a contract with the A. F. of L. on November 7 and resumed operations the next day on a modified closed-shop basis. Under the agreement, non-union workers employed must join a union within 30 days of employment. The agreement involved no increase in wages and all former employees were taken back without prejudice. According to H. B. Mathews, Jr., president, the strike cost the company a year's earnings.

Two other Ste. Genevieve operators, the Peerless White Lime Co. and the Ste. Genevieve Lime & Cement Co., are reported to have signed closed-shop contracts but refused to agree to other stipulations of the National Labor Relations Board having to do with alleged unfair labor practices.

Sales to Government Revealed by Report

During the four weeks ended November 12, 1938, nonmetallic minerals and their products valued at $1,552,682.27 were furnished to government agencies under the Walsh-Healey Public Contracts Act. Only contracts in excess of $10,000 each come under the law. The total comprises the following items:

Date of Delivery	Source of Supply	Material	Department	Amount
11/ 4/38	Anna Quarries, Anna, Ill.	Crushed stone	WPA	$13,073.20
10/24/38	Basalt Rock Co., Rockham, Cal.	Rip-rap	War	19,035.00
12/31/38	Shannahan Bros., Bly, Cal.	Stone	War	18,700.00
1/20/39	Tampa Sand & Material Co., Tampa, Fla.	Stone	WPA	25,058.20
Indef.	Jahncke Service, Inc., New Orleans, La.	Sand-gravel	WPA	88,410.00
1/19/39	Azusa Rock & Sand Co., and Maurice F. Joyce, San Gabriel, Cal.	Sand-gravel	War	19,960.00
2/ 1/39	Texas Sand & Gravel Co., Ada or Murdo, Tex.	Sand-gravel	Agric.	*18,200.20
Indef.	Craven-Lang Co., New Orleans, La.	Rock asphalt	WPA	19,040.00
11/30/38	Lester P. McArdle, Inc., Jackson Heights, N. Y.	Topsoil	WPA	21,120.00
	Total, stone, gravel and topsoil			*$242,596.60*
Indef.	Olympic Portland Cement Co., Seattle, Wash.	Cement	Treas.	$897,000.00
11/30/38	Whitehall Cement & Mfg. Co., Cementon, Pa.	Cement	WPA	10,885.40
10/28/38	Lehigh Portland Cement Co., Iola, Kan.	Cement	Agric.	*23,650.70
8/15/39	Riverside Cement Co., Crestmoor, Cal., and Southwestern Portland Cement Co., Victorville, Cal.	Cement	War	106,500.00
12/31/38	Whitehall Cement Mfg. Co., Cementon, Pa.	Cement	WPA	21,807.60
10/10/38	Monolith Portland Cement Co., Monolith, Cal.	Cement	WPA	12,425.71
Indef.	Whitehall Cement Mfg. Co., Cementon, Pa.	Cement	WPA	14,487.00
Indef.	Portland Cement Co. of Utah, Salt Lake City, Utah	Cement	Treas.	37,500.00
1/ 7/39	Whitehall Cement Mfg. Co., Cementon, Pa.	Cement	WPA	15,309.00
	Total, Portland cement			*$1,139,265.41*
12/15/38	Johns-Manville Corp., Pittsburg, Cal. and Waukegan, Ill.	Asbestos	Navy	*$14,497.58*
6/30/39	George T. McLean Co., Portsmouth, Va.	R-m Concrete	Navy	15,625.00
12/17/38	M. F. Hicken Co., Brooklyn, N. Y.	R-m Concrete	WPA	10,878.10
Indef.	J. & I. O'Roarke, Inc., Flushing, L. I., N. Y.	R-m Concrete	WPA	26,200.00
	Total, ready-mixed concrete			*$67,200.68*
10/24/38	J. Watts Kearney & Sons, New Orleans, La.	Concrete pipe	WPA	$10,330.00
10/30/38	Federal-American Cement Tile Co., Lincoln, N. J.	Con roof slabs	Navy	30,480.00
9/19/38	Collins Concrete & Steel Pipe Co., Portland, Ore.	Concrete pipe	Inter.	14,287.00
12/25/38	Concrete Pipe Co., Seattle, Wash.	Concrete pipe	Navy	10,400.00
Indef.	Lock Joint Pipe Co., Chicago, Ill.	Concrete pipe	WPA	23,625.00
	Total concrete products			*$ 89,122.00*
	Grand total			*$1,552,682.27*

*Estimated.

Illinois Stone Plant Suffers Fire Damage

REBUILD ON OLD FOUNDATIONS

The plant of the Morris Limestone Products Co. at Morris, Ill., was completely destroyed by fire on Monday, October 16, at a loss of about $30,000 which was only partly covered by insurance. The fire started at 9:00 a.m., either from a short circuit or a spark from an acetylene torch. The first sign of fire was when the oil-storage building alongside the plant went up in flames which spread so rapidly that efforts to check them were useless. Within 45 min. the plant building collapsed. The fire department from Morris arrived in time to save the office building and kept the crushers from being badly damaged. The accompanying picture shows what remained of the plant after the blaze was extinguished.

After the fire. . . . Morris Limestone Products Co.

Among the equipment saved was the primary crusher, a hammer-mill and a Traylor TY reduction crusher which had been installed earlier in the year. Equipment damaged beyond repair included two bucket elevators, two 2-deck vibrating screens, motors, electrical equipment, an inclined hoist as well as miscellaneous tools and supplies.

The company's chief product is agricultural limestone and the disaster occurred during the season of greatest demand for this product. Several thousand tons of agstone and dust in stockpiles are expected to last only a few weeks.

According to T. W. Shaw, secretary and treasurer of the company, the plant will be rebuilt using the same layout and the original concrete foundations. The new plant will be completed early in 1939.

EDITORIAL

Consumer Incomes and Business Profits

IN THE Bureau of the Census in Washington is a clock which records the growth of the population of the United States. Every 14 seconds, according to the data provided by the last census, a child is born; every 22 seconds a person dies; every 12 minutes an immigrant arrives; every 7 minutes an emigrant departs. Every 36 seconds the country's population gains one individual; in a single day it increases by 2,400, in a month by 73,000, in a year by 876,000. In the last nine years the growth has been more than 3 millions.

Every 36 seconds there is a new mouth to be fed, a new body to be clothed and housed, a new mind to be educated, a new personality to be adjusted and absorbed. Every day of the year 2,400 new consumers are added to the market potentialities of American industry. Medical science and a wider and better knowledge of infant welfare combine to save an annually increasing percentage of these newcomers from the ravages of disease, exposure, deformity and accident. A standard of living already high and a merchandising technique already well developed combine to increase a thousandfold the normal desires and needs of each one of these rapidly developing consumers.

Alert business enterprise, ever on the watch for new selling opportunities, builds new factories, sets up new communication facilities, provides new power, light and heat sources, increases transportation means, establishes new selling outlets to anticipate the growing requirements of a growing population. Advertising copy writers, stimulated by the clamor of their employers for ever-increasing sales, drive themselves night and day in their attempts to create new desires, to expand or divert old wants, to make people dissatisfied with what they have and hungry for new things. Statisticians pore over tomes of population data with slide-rules and adding machines ready at hand. Investigators plod from door to door and from store to store, tabulating the desires of men, women and children for everything from all-day suckers to steering-post gear-shifts and brushless shaving soaps. A new order of cartographers cover state and county maps with millions of dots, crosses and stars, "marking the spots" where there are women who should have suction cleaners, men who should clip their beards electrically, and children who should play with "constructive" toys.

And, as the result, artists, lay-out men, copy-writers and psychology sharps go into a huddle; a "campaign" emerges and is approved; the date for the opening blast is fixed; a button is pressed; and everyone sits back expecting it to be a "push-over." There is a flurry of sales to dealers and distributors, whose hopes have been artificially raised by the predictions of the campaign creators; then follows a pause, then a lack of reorders, then a little misgiving about the methods employed, then a frantic search for new "angles," a new "approach."

Meanwhile no one seems to have given a thought to the consumer's buying power, no one has made a study of consumer incomes, the distribution of those incomes, the cost of living. Manufacturers' desires to sell their products have been converted into consumers' desires to purchase them, but there the sequence ends. No one has done anything to provide the consumer with the means with which to buy; no one has been concerned with the question of whether his income is sufficient to provide an adequate purchasing power or even with the question of whether he has any income at all. Buying power is not even assumed; it is ignored.

Multiply this hypothetical case thousands of times and you have a picture of national economic instability. The country is dotted with thousands of manufacturing plants designed and tooled for mass production and able to satisfy the material wants of every inhabitant of the land, yet many of them operate—and even during the "boom" year of 1929 did operate—at less than their capacities. Hundreds of thousands of retail establishments offering merchandise or services do less business than they should or could, although they are prepared to furnish commodities or to perform work for which there is a real demand. No effort has been spared to produce articles and materials of genuine utility and serviceability; every known means has been used to make them available at prices that are usually commensurate with the cost of their production and sale; no opportunity has been overlooked in the desire to understand the public's needs and tastes and to satisfy them.

IN the field of consumption are more than a hundred million would-be buyers of manufacturers' and merchants' wares. Every day their wants, their desires increase; every day their outlook on life encompasses wider areas, suggests new activities, awakens new yearnings; their satisfaction is never complete. Dissatisfaction with what one has is the mainspring of progress; the longing and search for something better lie behind every cultural advance that man has made. Couple this natural urge for broader, better and more comfortable living with a ready availability of the material means of attaining it and you have the founda-

tion for a sound national economy. Add to it a widely diffused and continuously sustained purchasing power on the part of the masses and there need be no concern about lasting prosperity.

Every 36 seconds a new consumer enters the market, and every day during his life his needs and wants will grow. Every 36 seconds a potentially useful worker is made available for the tasks of industry, and every day during most of his life his capacity for socially useful service will grow. It is this capacity to serve and to convert his energy output into energy income through working for fees, salaries or wages that makes of him a potential buyer of the products of industry. When the opportunities for profitable labor are closed to him, even if but for a time, his earning power ceases and, resultantly, his buying power is diminished or extinguished. Makers of commodities can not sell them to men who can not buy. Men can not buy unless they can earn, and they can not earn unless they are employed. They can not be employed unless there is money for their hire, and there will be no funds available for wages unless their employers' commodities can be sold. Such, in primer style, is the economic circle in which each one of us occupies a position and plays a part.

NOT only is it true that the number of would-be consumers who would like to, but can not, buy, is, because of impaired or destroyed purchasing power, reduced, but the rate of their production is declining. In 1920 a new consumer appeared on the scene every 23 seconds; by 1930 the rate had fallen to one in every 36 seconds. The rate of population growth since 1930 has been only half as great, according to the findings of the National Resources Committee, as it was during the previous decade, and it is steadily declining, due to the falling birth rate. It is doubtful if the country's population will ever exceed 150,000,000 at any time within the next 25 to 50 years. The ratio of older persons to the total population is increasing rapidly and steadily; a fact which will account in a large measure for the growing popularity of the Townsend, Thirty-Dollars-Every-Thursday, and other old-age security plans. "Between 1935 and 1975," says the report of that committee, "the estimated increase in the number of persons 20 to 44 years of age amounts to only 6 per cent., whereas an increase of 69 per cent. is expected in the number of persons 45 to 64 years old." The same medical science and spread of knowledge that have been reducing infant and childhood mortality are lengthening the span of life.

So those of us who are interested in the maintenance of business operations on a profitable basis must concern ourselves seriously with this pressing problem of consumer income in a national sense. The number of new consumers coming into the market through birth is steadily and rapidly declining; the incomes of those who have already reached the age of spending and accumulation are too low to support industry on a profitable basis. Thus from two directions are the opportunities for the continuance of business operation, on the basis of continuous expansion and continually-growing profits, being restricted. It becomes increasingly important, therefore, for business men to strive actively for the establishment of politico-economic conditions that will favor not only a growth in total national income but a better distribution of that income throughout the population.

The National Resources Committee has found also that one-third of all American families and individual consumers had yearly incomes of less than $780 each in the year 1935-1936. One-half of them had incomes of less than $1,070 and two-thirds of them incomes of less than $1,450. The average income of the poorest third of the nation, constituting 13,000,000 families, was $471; that of the middle third was $1,076; that for the top third, those with incomes ranging from $1,450 to more than $1,000,000 a year, was only $3,000. The average income for all America's "consumer units"—29,000,000 families of two or more persons each and 10,000,000 individuals living alone or as lodgers—was only $1,622 for the families and $1,151 for the individuals. The poorest third of the population contributed almost 4,000,000 persons to the class dependent on public relief; it contributes most to the burden of taxation for government charity and least to the sustenance of business enterprise. If the taxes on business occasioned by the government's obligation to support its poor are to be reduced and if the profits of business operations are to be materially and permanently increased, means must be found to raise this lowest third of the population to higher-income brackets. The practice of birth control has probably not yet materially affected the rate of population increase in this group, which is the least able to support large families and to which birth-control information is the least available, but it will eventually make itself felt here, too. Nevertheless, it may be expected to remain large for a long time.

THE existence of millions of families and individuals with incomes at or below the subsistence level stands squarely in the way of future business recovery. The decline in the rate of population growth not only reduces our expectations for the continuance of the old rate of increase in the number of possible consumers, but it will tend inevitably toward higher wages by reducing the number of those who compete with each other in their quest for work. Even though you may produce nothing for direct consumption by the masses, your business future depends on the success of those who do. Even though you may produce principally or solely for governmental agencies, these can not continue to exact heavy taxes from an impoverished population. Every business man must, therefore, feel directly and intimately interested in the welfare of those large population groups whose regular purchases of the necessities and comforts of life form the bedrock on which profitable business must rest.

By W. E. TRAUFFER

NEW PHOSPHATE PLANT OF SWIFT & CO.

PERHAPS the most important development of the year in the land-pebble phosphate industry of Florida was the erection of a new washing and flotation plant by the Swift & Co. Fertilizer Works. This is not strictly a new plant, as much of the equipment had been used on the old washer nearer the drying plant which this washer replaced. It is an all-steel plant of the 3-unit type and its design follows current practice in this industry. It is located about 10 mi. southeast of the company's drying plant at Agricola, Fla. This new operation was designed by the company's staff under the supervision of G. H. McCoy, general manager of mines. The company's forces set all the machinery, and the steel work was done by the Ingalls Iron Works.

Swift & Co. started producing phosphate at Agricola in 1907. Steam shovels were used for some years for stripping the overburden and later hydraulicking was tried. Since 1919 drag-lines have been used exclusively for this purpose. Excavation of the matrix has always been done hydraulically, but water pressures have increased from 125 lb. to around 200 lb.

In March, 1935, the company adopted the flotation process controlled by the Phosphate Recovery Corp. A unique feature of the recovery of phosphate fines at the new plant is the equipment used in the operation of the so-called combined agglomeration-flotation process, developed and patented by Messrs. McCoy, Wright and Hall. The process is designed so that phosphate rock, which is too coarse for flotation and yet too fine to be handled over the washer because of the large percentage of coarse sand it contains, is separated from the sand. After treating the coarse feed with suitable reagents, phosphate particles agglomerate and pass over an inclined under-water screen while the sand passes through this screen. The tailings from the under-water screen go to the flotation cells where additional recovery of phosphate values may be made without further treatment with reagents.

The new plant near Agricola, Fla., with flotation department at left.

Looking down on hydraulicking operations. Pump draws from sump to plant.

The new washer contains only one original feature of importance. This consists of an additional separation of the material preceding the flotation machines. Belt-conveyors have replaced bucket-elevators in places and many other improvements of minor importance have been made.

Great progress has been made, however, in the efficiency of the equipment and methods used. The new drag-line used for stripping is paying for itself by moving dirt at low cost. The present low prices for phosphate and the intensive competition for business have made it necessary to cut costs wherever possible and it is doubtful if any industry is moving dirt more cheaply than it is being done here.

This condition also forced producers to adopt more efficient means of recovering the phosphate from the matrix. Washing methods alone now recover about the same amount of material as formerly, but where flotation and under-water screening by agglomeration methods are used, from 25 to 60 per cent. additional material is recovered.

The company's drying plant at Agricola has remained unchanged since 1926. A fertilizer-mixing plant is also operated there, but no phosphate rock as such is used in it. The power and railway facilities at Agricola are responsible for the plant's location there. Some of the phosphate rock is shipped to other states where the company's fertilizer plants, which manufacture superphosphate, are located. The remainder is sold to other fertilizer manufacturers.

One feature of the operation is the new drag-line purchased to remove the

overburden from this deposit. This Page "630" all-electric walking drag-line has a 160-ft. boom and operates an 8-cu. yd. Page heavy-duty bucket. Ie opens a cut 170 to 200 ft. or even more in width at the bottom, depending on the depth of the overburden, which varies from 5 to 35 ft. According to Mr. McCoy, the walking feature of this drag-line is a big advantage over the rail type because of its greater mobility. The longer boom makes possible deeper and wider cuts than could be made with the smaller machines formerly used.

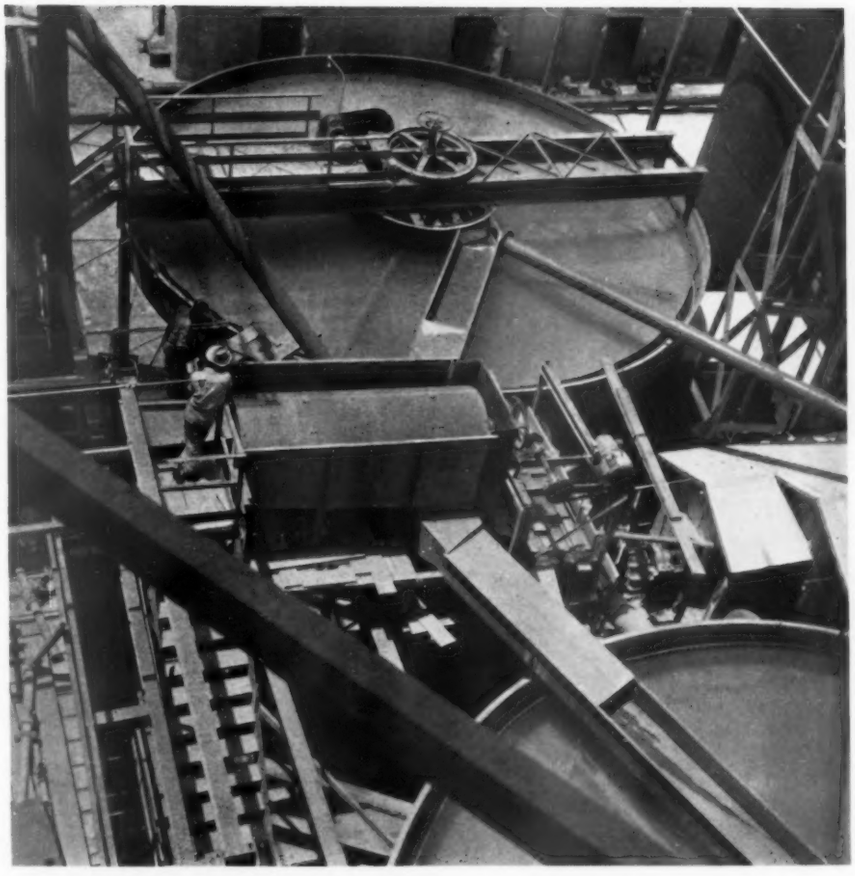
The matrix varies from 15 to 30 ft. in depth and is hydraulicked by means of two Georgia 1¾-in. nozzles fed by a 14-in. water-line. A 10-in. Georgia centrifugal pump driven by a 200-hp. G.E. motor picks up the slurry from the sump. At the time of the writer's visit to this operation material was being pumped 2,000 ft. against a vertical lift of about 100 ft. Two similar relay pumps were used in the line. Material is pumped to distances as great as 5,000 ft. by adding more pumps in the line. A 14-in. electric-welded medium-carbon steel pipe made by the A. O. Smith Corp. is used. These pipes have steel flanges attached by welding.

The sludge is discharged from the pipe-line into a feed tub which levels out surges and promotes an even flow of material through the plant. From this tub it is split to two series of screens, each consisting of four screens, equipped with sprays.

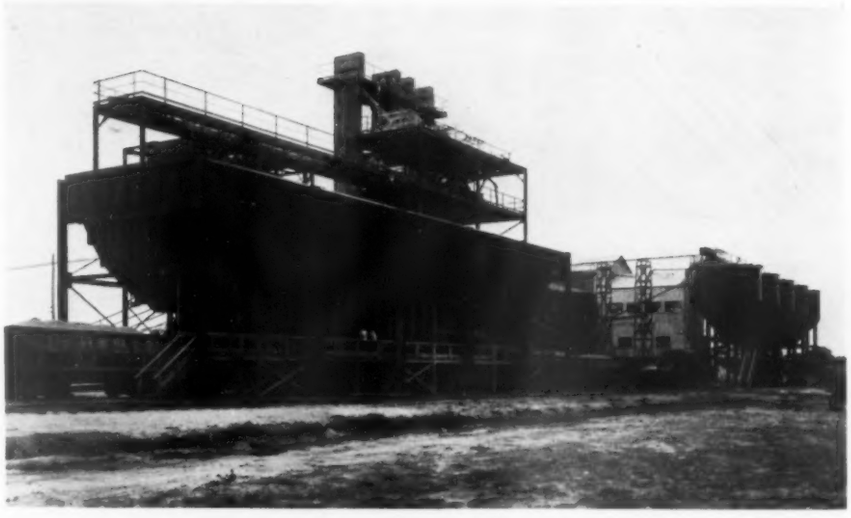
The first screen in each series is a 4-ft. by12-ft. Georgia trommel with 1½-in. round openings. The coarse material from this screen goes to a *débris* tub, from which it is sent to waste by a 10-in. Georgia pump. The next two screens in the series are 6-ft. by 12-ft. flat screens with 3/64-in. openings. The final screen is a 5-ft. by 12-ft. Link-Belt 1-deck positive-eccentric type vibrating screen with 3/64-in. openings. The material passing through these screens (minus 3/64-in.) goes to a 4-ft. by 12-ft. rotary screen which removes tramp material before going to the hydroseparator feed.

The oversize material from the last screen in each series (plus 3/64-in.) goes into a 400-ton steel surge tank. This tank feeds three sets of washing and screening equipment, which are so arranged that any one set can be shut down without interfering with the operation of the others. The first unit in each set is a Georgia 8-ft. by 20-ft. 2-shaft log-washer. A steel-inclosed belt-bucket elevator feeds the product of the washer to a 4-ft. by 5-ft. Link-Belt vibrating dewatering screen with 3/64-in. openings. The overflow from the three log-washers goes to a sump, and is pumped to the previously-mentioned rotary screen preceding the hydroseparators. Material passing through the dewatering screens (minus 3/64-in.) also goes to this rotary screen.

The material retained on each dewatering screen goes to another Georgia 8-ft. by 20-ft. dual log-washer. The overflow from these washers also goes to the sump. The product of each washer is elevated to a 4-ft. by 8-ft. Link-Belt gyratory scalping screen with ⅜-in. openings. The material retained on these three screens (plus ⅜-in.) can, if desired, be diverted to a crushing circuit, but is usually discharged into two of the three 400-ton steel storage bins for washed coarse rock. This circuit consists of a Georgia double-roll crusher, a Niagara scrubber, a 4-ft. by 5-ft. Link-Belt vibrating screen with ⅜-in. openings, and a bucket-elevator. The

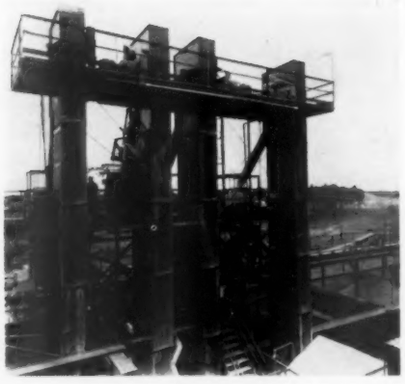


Looking down on the two 40-ft. hydroseparators.

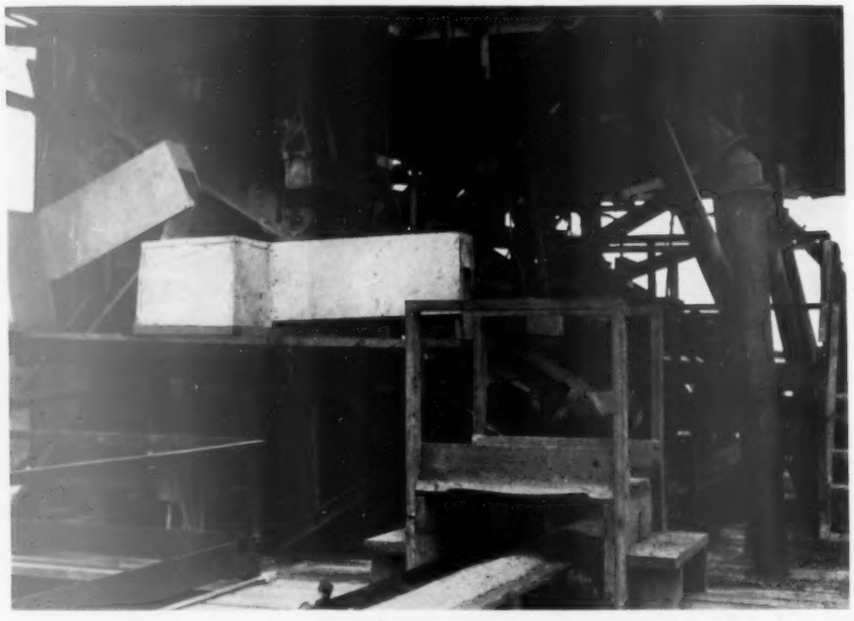


Wet-rock storage bins on washer at left. Product bin and phosphate-concentrate storage tanks at right.

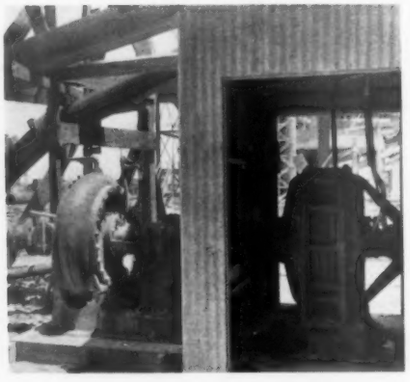
The 8-cu.yd. electric drag-line which was also used in constructing the plant.



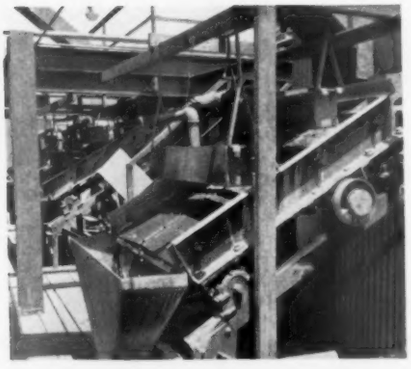
Battery of elevators at washer.



Finishing vibrating screens and belts to the wet-rock storage bins.



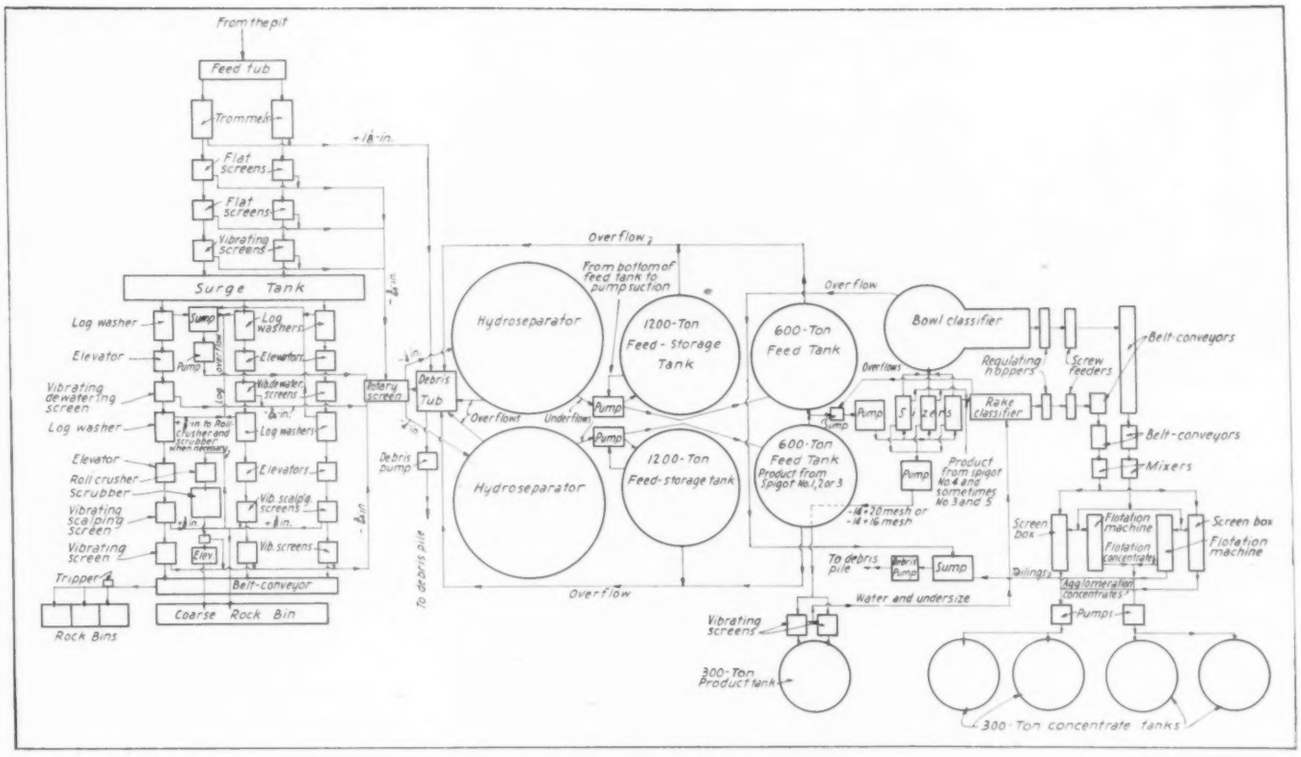
This 8-in. centrifugal pumps debris to waste.



Vibrating scalping screens in preliminary department.

One of the six log-washers showing it being lubricated while in operation.

A view of the reagent mixers.



Flow-sheet of washing and flotation operations.

bucket-elevator takes the oversize material to the same coarse-rock bins.

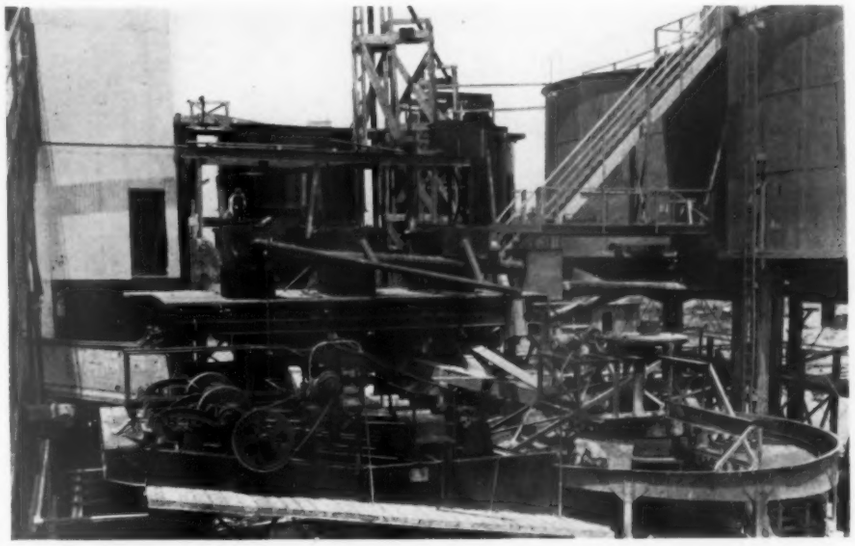
The material passing through the three scalping screens (minus ⅜-in.) goes to three 4-ft. by 8-ft. Link-Belt finishing screens with 3/64-in. openings. The material passing through these screens and through the screen on the crusher circuit goes to the rotary screen

The product of the log-washers, right, is elevated to the screens, upper left.

preceding the hydroseparators. The oversize material from these finishing screens is discharged on a 22-in. by 110-ft. horizontal belt-conveyor. A traveling tripper can discharge this material into any one of the three 400 ton steel bins already mentioned. These bins are of the suspension-bunker type. Washed pebble phosphate is loaded from them into cars to be hauled to the drying plant.

The rotary screen preceding the hydroseparators receives the minus 3/64-in. material coming from the 4 flat screens, the 2 vibrating screens, the 3 dewatering screens, the 3 finishing screens and the crusher-circuit screen and the overflow from the 6 log-washers as has already been described. This screen is 4 ft. in diameter and 12 ft. long and has ¼-in. openings. The undersize material is split to two 40-ft. Dorr hydroseparators. The overflow of these separators and any oversize from the rotary screen go to the *débris* tub and thence to waste. Two 8-in. centrifugal pumps, one Georgia and one Wilfley, send the underflow from each hydroseparator into its individual 1,200-ton feed-storage tank or 600-ton feed tank. The Georgia pump is also used for transferring materials from the storage tanks to the feed tanks. The overflow from all four tanks is returned to the *débris* tub.

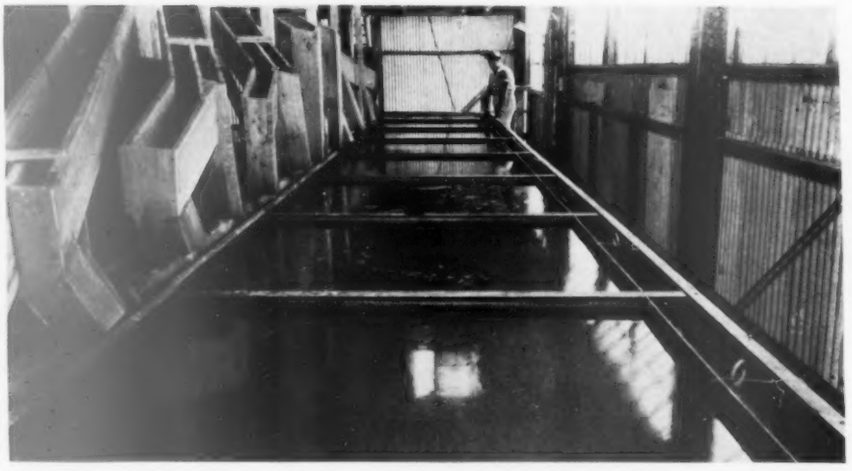
The material is discharged by gravity from the two feed tanks into a sump,



The 20-ft. bowl classifier with rake classifier and three 5-pocket sizers in background.

The flotation-agglomeration plant with feed tanks at right.

A view inside the flotation plant.



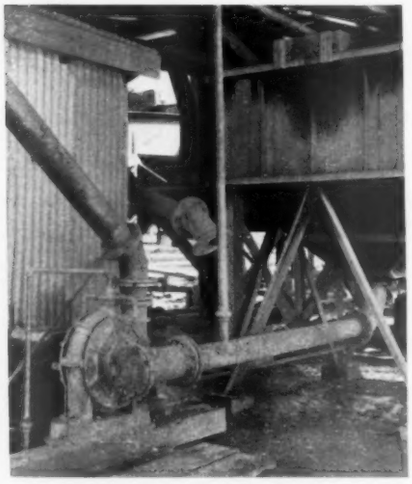
Underwater, stationary agglomeration screens.

from which a 6-in. Wilfley pump feeds it to 3 Dorr-Fahrenwald 5-pocket sizers. The two end pockets of each of these sizers are hand-operated and the center pockets are automatic. Separation is usually made at 20-mesh, but sometimes a minus 14-mesh to plus 20-mesh product is made. The plus product is obtained from the first and second spigots and usually also from the third spigot. This material goes to a 4-in. Wilfley pump feeding a pair of 4-ft. by 5-ft. Link-Belt vibrating screens. These screens have 20-mesh wire cloth, and dewater the product before it is discharged into a 300-ton circular, steel, product bin for car-loading.

The minus 16-mesh or 20-mesh product of the sizers can be withdrawn in two fractions. The coarse fraction, usually from the fourth spigot and sometimes also from the third and fifth spigots, goes to a 6-ft. Dorr rake classifier and is used for the combined agglomeration and flotation previously mentioned. The minus 20-mesh material passing through the two screens last mentioned also goes to the rake classifier. The fine fraction, including the overflow, from the sizers is straight flotation feed and goes to a 20-ft. Dorr bowl classifier with a 12-ft. rake. The overflow from the 6-ft. rake classifier is returned to the sump from which the sizers are fed.

Each of the two classifiers is followed by an identical series of equipment consisting of a regulating hopper from which a Link-Belt double-ribbon screw-feeder discharges the product to the first of a series of two 18-in. belt-conveyors. The last feed the classifier product to a vertical-shaft mixer where flotation reagents are added. The reagents are stored in horizontal cylindrical tanks and are transferred by a small pump into feeders over the mixers. They consist of fatty acids, caustic soda, fuel oil and rosin in varying amounts.

The mixer in the bowl-classifier flow discharges by gravity to a pair of Minerals Separation 6-cell counter-current



This 6-in. rubber-lined centrifugal pump handles the overflow from the log washers.

flotation machines. The product of these machines is transferred by a 4-in. Wilfley pump into two 300-ton steel concentrate tanks for car-loading.

The product of the mixer in the rake-classifier flow is discharged by gravity into screen boxes which again split the material into fine and coarse fractions. The fine product joins the material fed from the other mixer to the flotation machines. The fine product or concentrate is transferred by another 4-in. Wilfley pump into two more 300-ton steel tanks for car-loading.

(*Continued on page 40*)

Midwest Gravel Producers Hear Ahearn Explain Wage-Hour Act

ANXIOUS to hear the answers to dozens of perplexing questions, seventeen sand-and-gravel producers responded to an invitation, issued by R. E. Weaver, president of the Illinois Sand & Gravel Assn., to attend a meeting in the Palmer House in Chicago on November 9. They came from Illinois, Indiana, and Wisconsin to hear Vincent P. Ahearn, executive secretary of the National Sand & Gravel Assn., discuss the many problems that have arisen from the enactment of the Fair Labor Standards Act of 1938—popularly known as the wages and hours law—and the Public Contracts Act—better known as the Walsh-Healey Act.

Speaking on the latter subject first, Mr. Ahearn pointed out the necessity of each producer's carefully examining and fully understanding the conditions under which the material he sells may be used on government contracts. For example, a producer—called under the law a "source of supply"—who furnishes only a part of the material (even $10,000 worth or less) to a dealer who has a contract to supply more than $10,000 worth of material to a Federal government department must produce that material under the labor conditions set up by the law, according to Mr. Ahearn. The law does not specify wage rates, but these are determined for various industry groups whose representatives meet with Department of Labor officials in what are called "panel" conferences. Such a conference will be held in Washington on January 9, 1939, to determine the prevailing rates of wages for the crushed-stone, sand-and-gravel, slag, rip-rap, top-soil and oyster-shell industries, which have been grouped by the department for treatment as an industry unit.

Mr. Ahearn quoted figures compiled from the weekly reports of the Division of Public Contracts of the Department of Labor to show the extent to which the aggregates industries have furnished materials to various Federal government agencies between September, 1936, and September, 1938, under contracts amounting to more than $10,000 each. The record follows:

Sand and gravel	$ 7,438,813
Crushed stone	5,664,569
Slag	1,004,063
Rip rap	598,000
Top soil	1,230,000
Oyster shells	70,315
Total	$16,005,760

The difficulty of determining whether a company is at any time engaged in the production of material for interstate commerce and, therefore, under the Fair Labor Standards Act became increasingly evident as discussion developed. According to Mr. Ahearn, who clarified many of the rulings and interpretative pronouncements of the Wage and Hour Division of the U. S. Department of Labor, through which the law is being administered, the question is not to be determined by the percentage of any given producer's business which may be interstate in character, but by the fact that any part of his output enters interstate commerce and even if the material is sold at the plant. The mere passage of legal title has no bearing on the problem of deciding whether the material does or does not enter interstate commerce, as the location of the ultimate consumer—the point at which the flow of commerce ceases—is the governing factor. The production of gravel ballast delivered to a railroad for use outside the state in which it is produced would thus come under the act, and the labor, as well as clerical help, employed in its production could not be worked in excess of the maximum hours nor at less than the minimum wage rate set up by the law. When a plant is not producing material for interstate commerce, its employees do not come under the law, as, for example, during the winter shut-down or at other times when the plant may be producing solely for intrastate business. It is legal to pay some employees in accordance with the law's terms and others without regard to them, provided it is possible to segregate one group from the other. The test is made by the classification as interstate or intrastate of the material which each group is at any given time producing. However, Mr. Ahearn cautioned his listeners against carelessness or inadequacy in the handling and completeness of their employment records.

Mr. Ahearn urged upon those present a very careful reading of the law and of the national association's letters to members. These explain the application of the law to many of the perplexing problems that confront producers and in many cases may prevent the unintentional violation of its provisions.

After this meeting Mr. Ahearn left for Indianapolis, where he was scheduled to give a similar talk before Indiana producers on the following day.

The following association officers, members, non-members and guests attended the Chicago meeting:

V. P. Ahearn, executive secretary, National Sand & Gravel Assn., Washington, D. C.

E. N. Boynton, Northern Gravel Co., West Bend, Wis.

O. J. Ellingen, H. D. Conkey & Co., Mendota, Ill.

J. L. Fay, Moulding-Brownell Corp., Chicago, Ill.

C. E. Fraebner, Northern Gravel Co., West Bend, Wis.

N. R. Halliday, H. H. Halliday Sand Co., Cairo, Ill.

G. M. Hatfield, Material Service Corp., Chicago, Ill.

E. H. King, McGrath Sand & Gravel Co., Lincoln, Ill.

Frank E. Lane, Janesville Sand & Gravel Co., Janesville, Wis.

T. E. McGrath, McGrath Sand & Gravel Co., Lincoln, Ill.

J. S. Mollendorf, Atwood-Davis Sand Co., Chicago, Ill.

Charles J. O'Laughlin, Consumers Co., Chicago, Ill.

Stanley A. Phillips, PIT AND QUARRY, Chicago, Ill.

George W. Renwick, Chicago Gravel Co., Chicago, Ill.

Nathan C. Rockwood, *Rock Products*, Chicago, Ill.

John Seeman, Moulding-Brownell Corp., Chicago, Ill.

W. G. Spicer, Spicer Gravel Co., Marseilles, Ill.

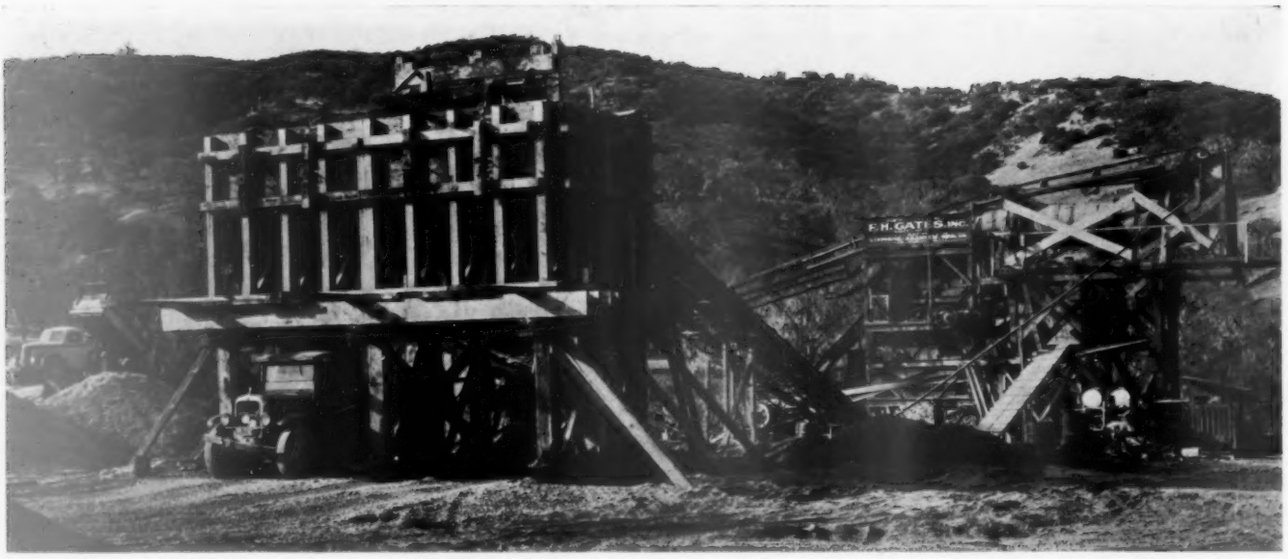
E. Guy Sutton, Neal Gravel Co., Mattoon, Ill.

Stanton Walker, director of engineering, National Sand & Gravel Assn., Washington, D. C.

R. E. Weaver, Lincoln Sand & Gravel Co., Lincoln, Ill.

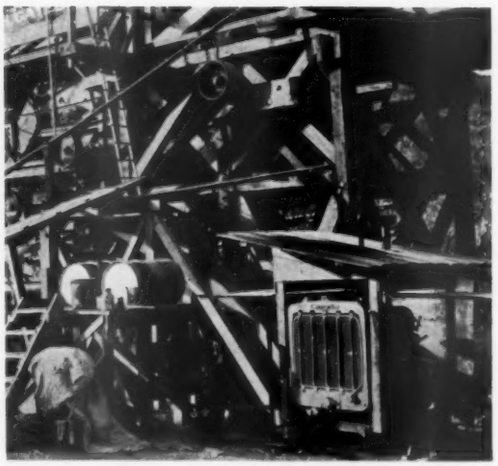
W. H. Wyckoff, Merom Gravel Co., Indianapolis, Ind.

Stone from the quarry is hauled to the crusher at this Pennsylvania plant by Koehring Trail-Dumps, tractor-trailer units of large capacity mounted on oversize pneumatic tires.



LOW-COST GRAVEL WITH DIESEL POWER

Driven by a Caterpillar Diesel engine the aggregates plant of F. H. Gates, Inc., near San Miguel, Cal., operates 8 hours per day at a fuel cost of about $2. Designed and erected by the Stephens-Adamson Mfg. Co., the equipment includes two vibrating screens, a 4-ft. by 20-ft. rotary washer, a 9-in. by 36-in. jaw crusher and 350-ft. of belt-conveyors. Average daily production is 600 cu. yd.



LEFT—General view of the Carroll plant with a truck dumping into hopper in the foreground. BELOW—The new gold mill shown while still under construction.

N. Y. Gravel Operator Prepares to Recover Gold on Large Scale

By W. E. TRAUFFER

THERE have been in the sand-and-gravel industry some deposits which have turned out to be "gold mines" for their owners. When this term is used literally, however, the field is narrowed down to a comparatively few plans which have deposits containing enough gold to pay for the expense of recovering it. The writer has seen a number of such operations, mostly in California, but also in Indiana, Iowa and Colorado. In all these cases the free gold was washed out of the waste sand. It remained for the state of New York to produce a deposit containing what is said to be a rich gold-bearing ore.

The deposit is that of the Carroll Sand & Gravel Corp. which in September, 1937, took over the plant and property of Carroll Bros., Inc., at Clarence, N. Y. According to C. H. Leo, part owner of the company, this property was purchased strictly as a sand-and-gravel operation and it was not until later that he noticed the similarity between the crushed gravel and the gold-bearing ores with which he was familiar.

Tests which were made showed that gold was present in quantities varying from traces to high values per ton. A small pilot plant, with a crusher, ball-mill, mercury plates and riffles, was used for over a year to make exhaustive tests which, according to Mr. Lea, bore out the earlier findings. Encouraged by these results, the company early in October began the erection of a 200-ton per day mill for large-scale recovery of the gold. This plant is expected to go into operation soon and, if successful, a larger mill will be built later.

The equipment to be installed in this plant consists of a Gibson combination elliptical-roll and ball mill, amalgamators and concentrating tables. The ore will be ground to minus 200-mesh. Mr. Lea believes that silver and lead may also be recovered. The tailings from this mill he expects to sell as fertilizer filler. The company owns 350 acres of gravel-bearing land and has options on 650 acres. J. Riley is superintendent of the sand-and-gravel operations and R. Haggerty is in charge of the gold mill.

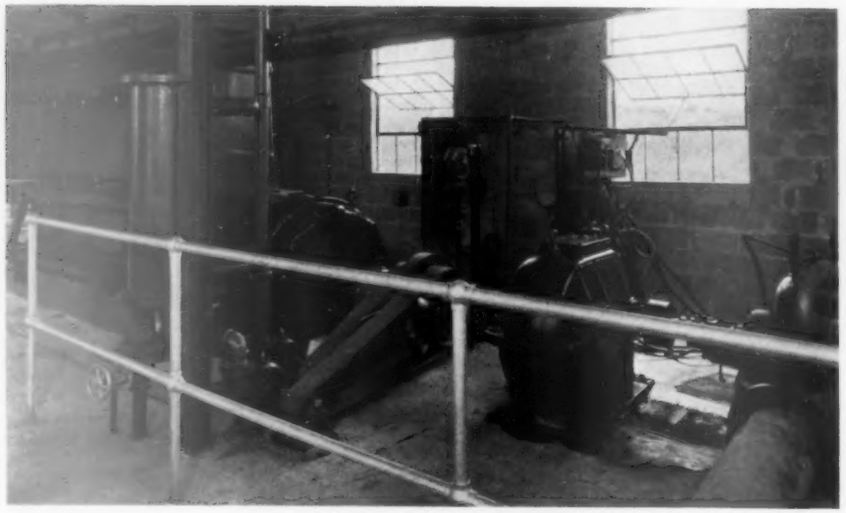
When taken over by the new owners this plant had not operated since the death of Wm. E. Carroll in May, 1934. The entire plant and all its equipment were overhauled, conveyor belts were replaced, and two vibrating screens and a Diesel power-plant were added. The former system of steam-locomotive transportation was replaced by truck haulage. Otherwise the plant is much as it was when it was described in the June 17, 1931, issue of PIT AND QUARRY.

Material is excavated in the pit with a Bucyrus 2-cu.yd. steam drag-line. Three International 10-ton trucks haul the material a distance of ¼ mi. to the plant hopper. A reciprocating feeder discharges the material on a 90-ft. inclined belt-conveyor which feeds a revolving scalping screen with 3-in. openings. The oversize material drops into an Allis-Chalmers No. 4 McCully crusher, whose product is returned on a belt-conveyor running to the first conveyor.

The material passing through the screen is discharged on a 265-ft. belt-conveyor, which carries it to the top of the screening plant. The screening is done by two Buffalo Screen Parts Co. vibrating screens operating in series. These have two and three decks, respectively. The gravel is discharged direct to the bins, while the sand goes to two series of equipment, each consisting of a Perfect screw-classifier followed by a 7-ft. Telsmith cone. The storage bin has a total capacity of 500 tons and the plant capacity is about 200 tons per hr.

The 300-hp. stationary Diesel engine which drives the generating equipment.

The two vibrating screens which do all the coarse sizing. Note the spray nozzles.



General view of the generating plant.

Sharing honors with the gold mill is the Buckeye Diesel-engine electricity-generating plant which is showing a 40-per cent. saving, compared with the price of purchased power, including all costs. This has been accomplished in

Left to right: J. Riley, superintendent of the gravel plant; C. H. Leo, part owner; R. Haggerty, in charge of the ore mill.

spite of the fact that Niagara Falls is only 25 mi. away and purchased power is relatively cheap. The company formerly paid $550 to $650 per month at a rate of 1.47 c. per kw. hr.

The two screw classifiers which receive sand from the vibrating screens.

The engine is a 4-cyl. 300-hp. machine which operates at 375 r.p.m. It drives direct on Ideal 125-kw., 156 kv.a., 240-v., 25-cycle, 3-phase alternator on the same shaft, which is supported on a Shafer anti-friction bearing. From this shaft two water pumps and an exciter are driven by belts. The end of this shaft is connected to the slow-speed shaft of a Foote gear-reducer which acts as a speed increaser to drive a 10-in. Fairbanks-Morse water pump. This engine is said to be large enough to operate the gold mill as well as the gravel plant. Incidental equipment includes a switchboard and an Alnor selective exhaust-temperature indicator.

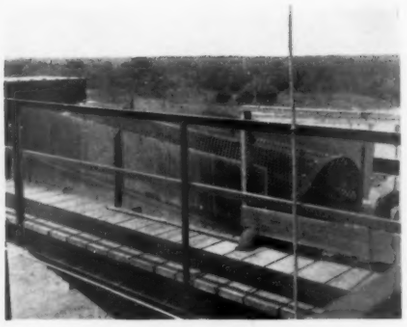
The power-plant building is of concrete and concrete-block construction and also houses a 9-in. by 12-in. Pennsylvania air-compressor driven by an electric motor. This furnishes air at 50 lb. pressure for two 175-ft. deep wells, which supply all the water for the plant. The water is pumped by air injection into a pond, from which the 10-in. pump already described supplies the plant.

For weighing truck shipments the company uses a 335,000-lb. capacity Fairbanks scale, which was originally a railroad-track scale and has a 12-ft. by 56-ft. platform. The company also has a 40,000 lb. Fairbanks truck scale.

Swift (from page 36)

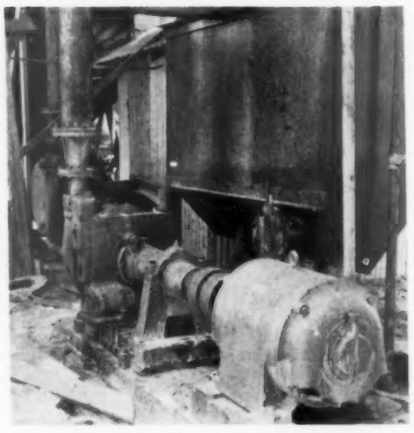
The tailings of the flotation machines go to a sump, which also receives the overflow of the bowl-classifier. An 8-in. Georgia pump discharges this material on a *débris* pile. The use of gravity feed from the mixers to the flotation machines and screen boxes eliminates handling of the rock after conditioning and the resultant loss of reagents.

At present all the water used in this plant is supplied from two 12-in. wells



One of the two revolving scalping screens from which oversize is wasted.

by Layne & Bowler deep-well pumps of 3,000-gal. per min. capacity. The main mining pump consists of two Worthington pumps which are mounted on the same shaft, and develop a pressure of 200 lb. at the pump. Water for the washing plant is supplied



The 4-in. and 6-in. pumps which feed from and to the sizers, respectively.

by a 2,000-gal. per min. Allis-Chalmers pump at 40 lb. pressure and a 3,000-gal. per min. Allis-Chalmers pump at 25 lb. pressure. A 5,000 gal. per min. Allis-Chalmers pump supplies water for the flotation plant at 25 lb. pressure.

The pit now being excavated will be used for water storage as soon as it is worked out, as the wells will not be able to supply the needs of the plant the year around. A ditch has been dug with a Marion Diesel drag-line to carry the waste water from the plant to this pit. This machine is powered with a 135-hp. Caterpillar Diesel engine and is ordinarily used for moving pipes, pumps, etc.

Made Chief Engineer

The Marblehead Lime Co. of Chicago, Ill., has appointed Mark R. Woodward as its chief engineer. Mr. Woodward was formerly with the Babcock & Wilcox Co. in the Cement Mill Division and previous to that was assistant chief engineer of the Lehigh Portland Cement Co.

Continued Progress in Fuel Economy Is Predicted for Cement Industry

A PREDICTION that already extensive progress of fuel efficiency in the cement manufacturing industry would continue for at least the next ten years is contained in the report of a survey of fuel consumption in this field, recently made public by the Works Progress Administration.

The report, *Fuel Efficiency in Cement Manufacture, 1909-1935,* shows that, through economies introduced in the industry during the period covered in the study, the average consumption of energy at the plants had declined from 189 lb. of coal or coal equivalent per bbl. of cement in 1914, to 159 lb. in 1935, with further reductions in prospect as new improvements are adopted and equipment already successfully applied becomes more generally used.

The cement industry was selected for the study because, since it had made less progress in this direction than more important fuel-consuming industries, such as electric-power stations and steam locomotives, the data developed in the survey were regarded as presenting a conservative picture of technological advances made in fuel utilization.

The survey was conducted by the W.P.A. National Research Project in coöperation with the Bureau of Mines of the U. S. Department of the Interior. In his letter of transmittal to W.P.A. Administrator Harry L. Hopkins, Corrington Gill, assistant administrator in charge of all W.P.A. research, characterized the progress made in fuel economy as "an outstanding example of man's ability to do more units of work with less raw material."

The report was prepared by Nicholas Yaworski, Vivian Spencer, and Geoffrey A. Saeger of the W.P.A. Research Project, and by Dr. O. E. Kiessling, chief economist of the Bureau of Mines Mineral Production and Economics division.

The effect of fuel economies on the fuel-producing industries also is discussed, as well as their effect upon employment. The report observes that fuel-saving devices and substitution of other fuels which require less labor in their production have reduced the demand for coal and have brought increasing unemployment in the coal fields in the last two decades.

"Improved fuel-saving techniques," the report comments, "have affected production and employment in the entire fuel-producing industry, including oil and natural gas, and have resulted in fuel savings per unit or product which, since the war, have amounted to more than 55 per cent. in central electric-power stations, 28 per cent. on freight trains, and 15 per cent. in blast-furnaces and cement plants. These influences are expected to continue. While a general revival of business would increase the demand for fuel, it would also encourage greater investment in fuel-saving equipment."

The long-time effect of this increased efficiency upon fuel producers is apparently problematical, the report remarking that "some close observers have suggested that advances in fuel efficiency tend to stimualte an aggregate increase in fuel consumption and that the reduced unit cost of fuel is reflected in lower prices of products; these lower prices in turn greatly stimulate the consumption of the products involved, and, eventually, the larger consumption more than offsets the savings in fuel per unit of product."

Reviewing the substantial progress made by the cement industry in the 25 years covered by the survey, the report points out that when the increased fuel efficiency of central electric-power stations is included in the trend, the energy consumption in the cement industry declined 27 per cent.—from about 193 lb. of coal and coal equivalent per bbl. of cement in 1914 to 141 lb. in 1935—as compared to the reduction of 16 per cent. shown when the influence of the efficiency of power plants is excluded.

The difference between the two trends is explained by a more rapid decline in the rate of consumption of fuel by the central electric-power stations than by cement plants, and by the fact that a large amount of electric energy is consumed by cement plants, with about half of it being purchased. Between 1919 and 1935 the consumption of fuel in the production of a kilowatt-hr. of electricity by central power stations decreased 55 per cent., while, in the same period, the consumption of fuel and purchased electricity (converted to fuel through the use of a constant factor) fell off only 15 per cent. per bbl. of cement.

The study showed that the energy consumption per barrel of cement increased slightly from 1909 to 1914, then followed a downward course which became most rapid from 1919 to 1923. Excluding the influence of electric-station fuel efficiency, the decline in energy consumption in the 4-year period between 1919 and 1923 was 10.6 per cent. as compared with a total decline of 14.6 per cent. in the 17-year period 1919-1935. However, when the influence of electric-station fuel efficiency is included, the declines in the same periods were 13.5 and 24.4 per cent., respectively. The accelerated decrease immediately following the war was stimulated by high fuel prices that made increased efficiency worth while.

While many fuel-saving techniques were introduced and a number of plants effected substantial savings, little progress was made in reducing fuel consumption by the industry as a whole from 1928 to 1935. In fact, the report points out, in this period, when equipment was operating at a greatly reduced capacity, there was a slight increase in the average consumption of energy at cement plants that was offset by continued progress of fuel efficiency at central electric-power stations.

This small increase in consumption of energy per barrel was due in part to finer grinding of the clinker. In recent years, the report explains, there has been a marked tendency toward finer grinding, as an aid to the rapid hardening of concrete, and this finer grinding consumes greater energy.

"Aside from the fuel efficiency of cement kilns," the report adds, "a number of factors affect the total consumption of raw fuel at cement plants. Among these is the source of the electrical-energy supply. Cement plants that use the hot exit gases from their kilns to generate their own electricity by the employment of waste-heat boilers consume less fuel than those which generate their electricity in separate fuel-burning power plants.

"Cement plants that purchase their electricity consume less fuel than plants that generate their power in fuel-burning power plants and a little less fuel than those using waste-heat boilers. Plants with steam shovels and locomotives require more fuel than those which have electric shovels and locomotives. Some savings in the use of fuel for the purpose of drying raw materials in dry-

process plants have been made by replacing hand-fired driers with more efficient equipment using pulverized coal.

"Since kilns consume the largest part of the total fuel used by cement plants, however, an analysis of the progress that has been made in fuel efficiency in cement manufacture is essentially an analysis of technical advances in the utilization of fuel in cement kilns.

"Improvements in the fuel efficiency of rotary kilns have taken place mainly through reducing the losses of heat or by using heat that formerly would have been lost. Cement manufacturers have found ways to reduce or retrieve the heat previously lost up the stacks through hot waste gases, through hot clinker discharged from the kilns, and, to a small extent, through radiation from the kiln shells. Fuel also has been saved by reducing the amount of heat needed; by treating raw materials to reduce their moisture content; by making them more susceptible to heat through finer grinding; by the addition of fluxing agents; and by other methods."

Actually, the study showed, the appreciable increases in fuel-saving in the industry between 1927 to 1935, were in the wet-process plants, which showed a reduction in fuel consumption of 19.2 per cent. in contrast to a decline of only 8.2 per cent. for all Portland-cement plants in the same period. This is due largely to the fact that more of these plants, incorporating the newest and most modern equipment, have been erected in recent years, 28 of the 30 new plants erected during this 9-year period belonging to the wet-process class.

Probably the most important technical change in reducing fuel consumption, the survey found, was the increase in the length of rotary kilns. Longer kilns were constructed in some number between 1905 and 1920, but a considerable lengthening occurred between 1925 and 1930, when the average length of kilns increased about 18 ft. In 1925 only 56 of the 810 kilns in the industry were 200 ft. or more long, while by 1935 there were 119 of such kilns out of a total of 823.

Until 1910 most kilns were from 60 to 80 ft. long. Thomas Edison in 1903 made a radical change by putting 150-ft. kilns in operation in his plant at Stewartsville, N. J., and his experiment was watched with interest. When the operation of his kilns indicated large fuel savings—it was reported his kilns consumed as low as 65 lb. of coal per bbl. of cement, while 60 ft. kilns working on dry limestone-clay mixtures consumed from 110 to 150 lb.—other installations of long kilns followed rapidly. All the kilns installed since then have been more than 100 ft. long and some of the latest are 400 ft. in length.

Longer kilns not only reduce the loss of heat through exit kiln gases but at the same time make it possible to use a higher inclination, to feed faster, to revolve the kiln more rapidly and still get a well-burned product. The result is increased production with less fuel per barrel of clinker produced.

The report adds that it should be noted, however, that unless the length is increased in greater ratio to the diameter the fuel efficiency will not be increased, for the fuel requirements decrease with an increase in length relative to daimeter and increase if the diameter increases relative to the length. Here again it is the wet-process plants that have shown the greater gains in fuel efficiency, the dry-process plants gaining comparatively little in fuel savings through the use of longer kilns.

Another important contribution to fuel efficiency in the wet process has been the introduction of filters to remove water from the slurry. In most wet-process plants the slurry is fed into kilns in semi-liquid form with a moisture content from about 33 to more than 50 per cent. The lower the moisture content of the material entering the kiln, the smaller is the amount of heat required to evaporate the water, and through these filters it has been possible to reduce the moisture content to as low as 18 or 19 per cent.

Two general types of slurry filters are in use, the disk and the drum types. In both the principle of operation is the same. The wet slurry comes in contact with a fabric, on the opposite side of which a suction is induced to draw off the moisture through use of a vacuum pump. The filters operate continuously and automatically in a cycle of filtering, dewatering and discharging.

The actual savings vary, of course, with the amount of moisture removed. While slurry filters have been used on kilns from 100 to 300 ft. long, their greatest use is on the shorter kilns. In those plants where the moisture of the slurry is not reduced before its entrance into the kiln it must be evaporated in the kiln and to facilitate this some wet-process plants have equipped the kilns with chain baffles, also called chain curtains. These consist of lengths of chain which, as the kiln rotates, dip in and out of the slurry, break up lumps and bring the slurry into contact with the hot gases, thereby facilitating the evaporation process. Kilns not equipped with chains sometimes are provided with lengths of angle irons or lifters, attached longitudinally to the interior of the kilns, which serve the same general purpose as the chain baffles but are not so efficient in facilitating the exposure of the slurry to heat.

Fuel economies made possible by the use of heat-transfer devices are variable, but examination of the results at a dozen or more installations showed average fuel reductions of 5 to 10 per cent., although some plants indicated savings as high as 15 per cent., while others reported no appreciable economies.

One of the largest potential sources of heat loss is through the hot clinker which leaves the kiln. Rotary coolers are most commonly used to cool the clinker, although other types of coolers, recently developed, have been designed as integral parts of the kiln and more efficient stationary types of clinker coolers—called clinker-heat recuperators—have been installed in a number of plants since 1931.[1]

The rotary cooler, although it saves only part of the heat and loses much by radiation from the cooler shell by heat leakage between the cooler and the kiln and with the clinker itself, generally has made possible a saving of fuel estimated at from 5 to 7 lb. of coal per bbl. of cement.

The coolers designed as part of the kiln avoid those heat losses due to radiation and leakage, and one kiln equipped with such a cooler is reported to have required 16.6 per cent. less fuel than other kilns not so equipped.[2]

The clinker-heat recuperator consists of a heat-resisting grate over which a bed of clinker being discharged from the kiln is moved slowly by a shaking motion or by conveyor chains, and through which a blast of air is driven from below. The air forced through the layer of hot clinker cools it rapidly and serves as a secondary and even as a primary air supply for the kiln.

Savings of fuel are made not only through the use of clinker heat to preheat the air for combustion, but also by the conservation of the heat surrounding the clinker. The latter saving is obtained through the use of a barrier or heat reflector installed opposite the open end of the kiln to reduce the space in which the hottest air is located and at the same time to reflect back into the kiln the heat radiated from the clinker. While the fuel savings of the air-quenching cooler are reported at about 15 per cent.,[1] this type of cooler has the added advantage in that the rapid cooling produces strains in the clinker and makes it more fragile, thus reducing the amount of power required for grinding.

Other factors which the report says have contributed to a reduction in fuel

(*Continued on page 46*)

[1] Moyle (Frank).—*Clinker-Cooler Installation Cuts Coal Consumption Fifteen Per Cent.* Pit and Quarry, January, 1934, pp. 73-4.

[2] Catlin (A. W.).—*Major Economies in Burning Cement Clinker in the Rotary Kiln.* Pit and Quarry, June, 1933, pp. 25-8.

The Lubrication of Equipment

II. Wire Rope

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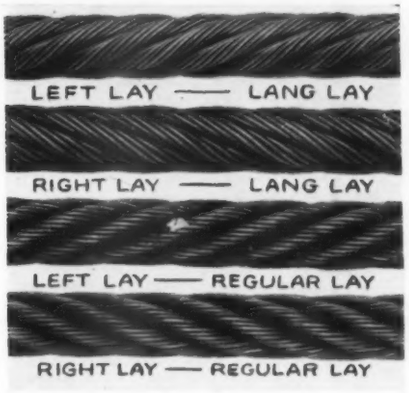

Fig. 1—Differences between Lang-"lay" and regular-"lay" wire rope. In the former the wires in the strands are wound in the same direction as the strands in the rope, in the latter they are wound in the opposite direction.

IN ORDER fully to appreciate the important part that correct lubrication plays in the useful life of wire rope it is essential that their rather complex construction be more fully understood.

Standard production ropes are composed of as few as 42 to as many as 252 individual wires, which are twisted into strands. Each strand is, in turn, composed of 7 to 42 individual wires. With one or two exceptions, the rope is made up by twisting either six or eight of these strands together. Strands are twisted about either (a) a hemp core, (b) a wire strand, or (c) another wire rope.

When the strands are twisted from left to right, the rope is called a "right-lay rope." Conversely, when the strands are twisted from right to left, the rope is called a "left-lay rope." And, when the individual wires are twisted in a direction opposite to that of the strand, the rope is termed a "regular-lay rope." But, when the individual wires are twisted in the same direction as the strands, the rope is termed a "Lang-lay rope." (See Fig. 1.)

The regular-lay rope is used for a variety of services, such as are met with in hoists, derricks, power shovels, draglines, etc. This method of twisting results in a rope that does not untwist easily, but does not present the best possible wearing surface. The Lang-lay rope untwists more easily than the regular-lay rope and is more difficult to splice. It, however, is somewhat more flexible, will withstand fatigue action better, and presents a greater wearing surface and consequently has a longer life.

As shown in Fig. 2, there are, in general, at least seven common types of construction or methods of arranging the wires around the core of round ropes.

The flexibility of the rope depends on the lay, the type of core, the construction, the process of manufacturing, and the physical properties of the metal used in making the individual wires. Other things being approximately equal, the smaller the diameter of the individual wires the greater the flexibility of the rope. Hemp-core ropes are more flexible than wire-core ones. Consequently, wire-core ropes work to best advantage over drums and sheaves of large diameters, which do not cause excessive bending.

The two common methods of making wire rope are: (1) the standard process, and (2) the preforming process. In the standard process the strands are forcibly twisted around a hemp or wire core, while in the preforming process, the strands are shaped and set to the helical form which they retain permanently in the finished rope. Internal stresses and strains are set-up in ropes made by the standard process and they tend to untwist or fly apart when cut. On the contrary, ropes made by the preforming process do not tend to loop, kink, or untwist when cut. Ropes made by the preforming process are flexible, relaxed, and limber. Manufacturers of this type of rope state that it is 80 per cent. broken-in when it leaves the mill.

Rope drums and sheaves should be as large in diameter as is practical. Experience has proved that the life of rope increases with increasing diameters and decreases with increasing velocities. For most economical rope life it is advisable to design the drums and sheaves so that the tread diameters are approximately as shown in Table I.

	Diameter of Drum or Sheave	
	Average	Minimum
For 6 by 7 rope	72 × diameter of rope	42 × diameter of rope
For 6 by 19 rope	45 × diameter of rope	30 × diameter of rope
For 6 by 37 rope	27 × diameter of rope	18 × diameter of rope
For 8 by 19 rope	31 × diameter of rope	21 × diameter of rope

Table I—Recommended Sheave and Drum Diameters

The overlapping of ropes on drums should be avoided whenever possible. The grooves of the drums and sheaves should be smooth and of slightly larger diameter than that of the rope. If the

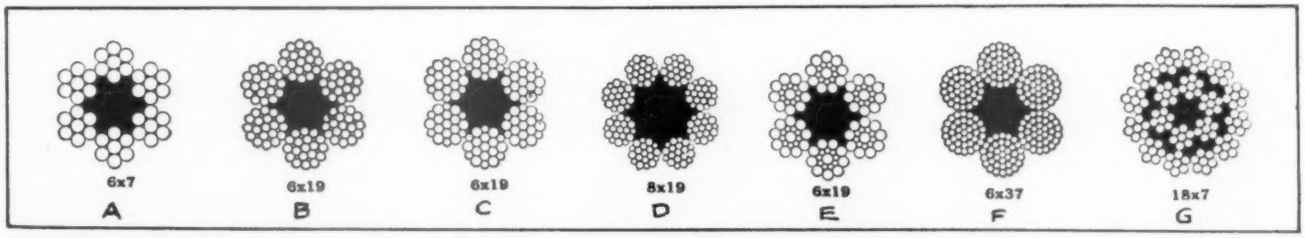

Fig. 2—Cross-sections of a few standard types of wire rope. A, Haulage and standing rope; B, Hoisting rope; C, Warrington construction; D, Extra-flexible hoisting rope; E, Seales construction, for use where abrasion is a governing factor; F, Special extra-flexible hoisting rope; G, Non-rotating construction.

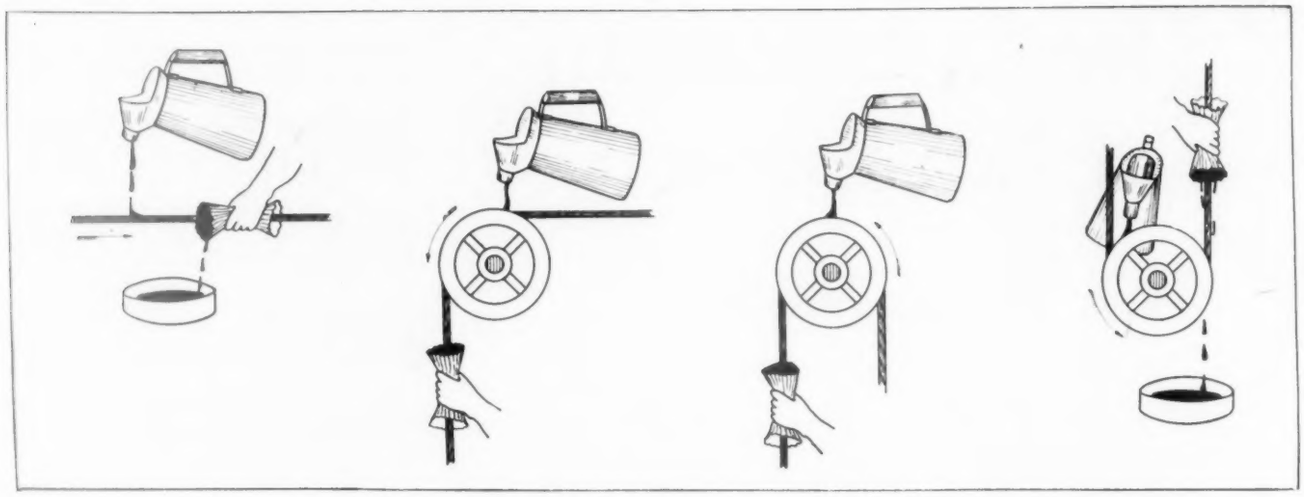

Fig. 3—Various applications of hand oiling, the arrows indicating the direction of rope travel.

groove is too large, however, it will not properly support the rope, thereby shortening its life. If the drums are not too small as to cause excessive flexing, coarse-wire rope will have a longer life than finer-wire, more flexible rope.

From the foregoing discussion it is obvious that many different kinds of ropes are obtainable, each possessing certain characteristics which make it best suited for certain specific purposes. Some operations require maximum flexibility and little strength, while others require relatively little flexibility but maximum strength. The selection of the best rope for the purpose at hand is not an easy task in many cases, yet the useful life of a rope depends on, first, the selection of the right grade, size, lay, and construction; and, second, on the proper care of it while in service and in periods of shutdown. The latter is mainly a matter of correct lubrication.

Actually the lubrication of wire rope begins while the rope is being manufactured. The hemp core—the most prevalent core used to-day—is usually received at the mill in a treated condition, which protects it against deterioration and bacterial reaction while in storage. Normally a compound of petrolatum and *dégras* (recovered as a by-product from treating leather or the processing of wool fat) is used and is followed by a treatment with either pine tar or copper oleate.

In the mill lubrication of the rope starts with treating the individual wires with a suitable protective lubricant as they are drawn through the forming die in the process of twisting them into strands. This process is known as "strand-stuffing," and involves the application of the compound in a heated condition at a focal point just before the wires enter the die.

These strands are again lubricated in a similar manner along with the core during the process of twisting up the rope. Not only are the individual wires, strands, and core lubricated, but the core absorbs considerable lubricant, thereby acting as a storage reservoir for the lubricant during the life of the rope.

Experience has shown that the lubricant for this purpose should possess sufficient body, adhesiveness, and cohesiveness as not to drip at high temperatures, which may at times be as high as 130 deg. F., and at the same time not be so viscous as to crack in cold weather. Although the lubricant must not crack, it still must dry sufficiently on the exterior surfaces of the rope so as not to collect dirt and dust in storage.

Lubrication in Service. — Although manufacturers generally thoroughly lubricate wire rope during the process of manufacturing, through repeated load application this "built-in" lubricant is gradually expended. It is advisable, even necessary, therefore, to lubricate rope frequently while in service. If not frequently lubricated during service, the surfaces become exposed to the corrosive action of moisture, the core hardens, absorbs moisture, wears, and collapses.

A wire rope is a machine requiring lubrication for its frictional surfaces just as any other machine. The lubricating problem encountered in wire rope is rendered still more complex by the fact that practically every unit of surface of the wires is subjected to frictional wear and exposure. The total area of the wires exposed to wear and corrosion is very large. For example, in a 1-in., 6-strand rope, 100 ft. long, the total area is about 110 sq. ft., assuming 7 wires per strand; for 19 wires per strand the area is 250 sq. ft. The visible external area is, however, only about 35 sq. ft., but the internal area requires protection as well as the external.

External wear and corrosion are easily seen, but when such damages occur internally, the rope may be seriously weakened without detection. For this reason *internal lubrication* is very important.

Corrosion is perhaps the most com-

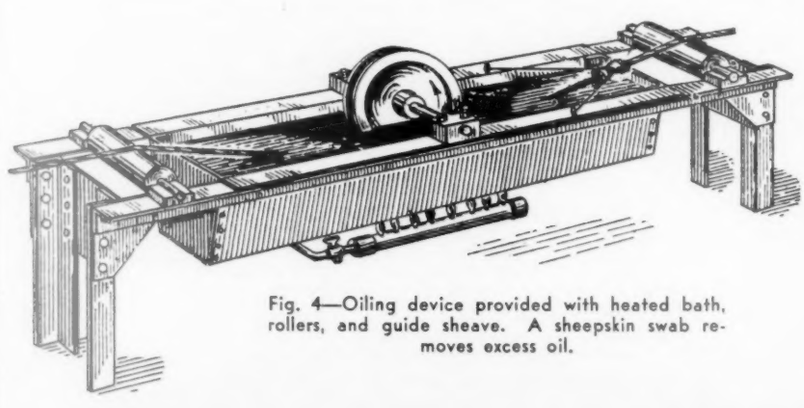

Fig. 4—Oiling device provided with heated bath, rollers, and guide sheave. A sheepskin swab removes excess oil.

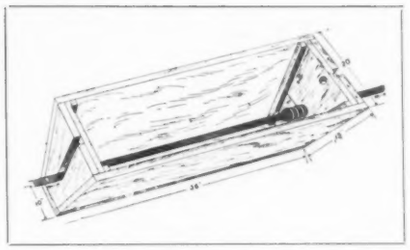

Fig. 5—An inexpensive but efficient wooden box for applying oil to a horizontal rope.

mon cause of rope failure. Moisture penetrating the rope fills all the free spaces between the wires and enters the hemp core. The exterior surfaces dry quickly, but the voids and hemp core retain the moisture, thereby accelerating corrosion and pitting.

A second cause of corrosion is wear. This is not confined to the exterior surfaces. As the rope is flexed around sheaves and drums the wires slide or rub over one another, causing wear that is not visible. Such wear is more rapid when the rope is exposed to abrasive dust and grit, which work into the spaces between the wires.

Purposes of Lubrication.—The lubricant used for wire rope should properly perform three major functions:

(1) Provide strong, tenacious films over all the surfaces, effectively lubricating the individual wires and wearing surfaces of the drums and sheaves, thereby minimizing wear and friction.

(2) Fill completely the free spaces between the individual wires, thus excluding moisture, dust, grit, and other harmful substances.

(3) Saturate the hemp core, providing a reserve of lubricant and maintaining the core soft and flexible.

The correct lubricant, so applied that it will creep into and fill the voids and saturate the core, retards corrosion, maintains the core soft and pliable, and lubricates all surfaces, thus reducing wear.

Requirements of the Lubricant.—In order to meet the above three major requirements the lubricant must possess certain definite characteristics.

The capacity to penetrate into small spaces is perhaps the most important property of the lubricant. As penetration is greatly affected by fluidity, it is desirable from this standpoint to use a comparatively light-bodied oil. Unfortunately, it is not possible to make a relatively light-bodied oil of high penetrating ability and also of sufficient body and tenacity to withstand the severe service to which rope is generally subjected.

Consequently, to provide films capable of sustaining heavy pressures, resisting the throwing-off effect of centrifugal force, and the washing action of water, the lubricant must possess a fairly heavy body and adhesiveness or tenacity. Heavy body without tenacity is not sufficient. For example, greases possess heavier body or consistency than residual petroleum oils, yet experience shows that they do not meet the requirements of a good rope lubricant.

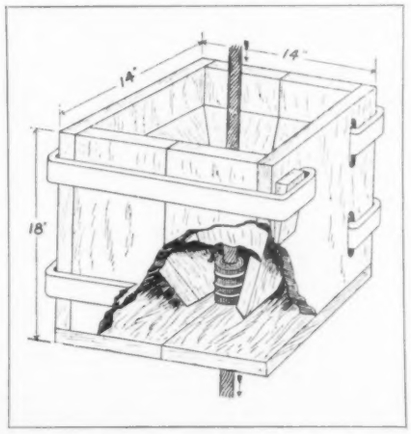

Fig. 6—Wooden box for oiling vertical rope.

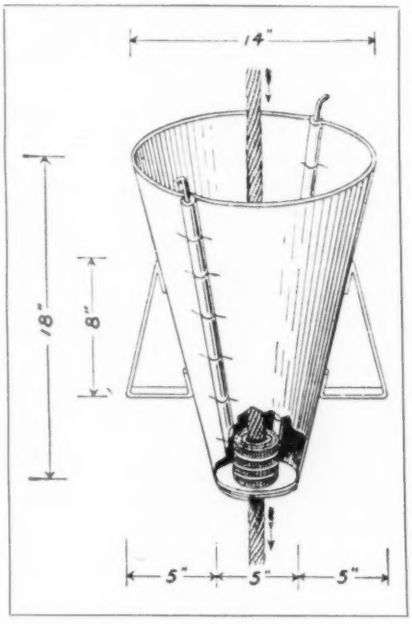

Fig. 7—A metal cone lubricating device for vertical rope.

It might be thought from the foregoing discussion that a compromise would have to be made when selecting rope lubricants. Such, however, is not altogether true, since the fluidity of all petroleum oils increases with temperature, and it is therefore possible to select a heavy residual oil and, by applying it hot, secure efficient distribution and thorough penetration. Attempts have been made to use a light-bodied oil for internal lubrication and a heavy-bodied oil for the outside coating. This scheme, however, has not proved satisfactory because of the lighter oil working out and destroying the tenacity of the heavier surface coating.

Naturally the lubricant should not contain any material in which chemical changes may occur to cause corrosion. To prevent washing off it should not be water-soluble, yet it should be soluble in gasoline or kerosene to allow an occasional cleaning of the rope.

Experience shows that for *moderate and severe service conditions* a heavy-bodied, tacky, residual, pure mineral petroleum product having a viscosity of approximately 1,000 sec. Saybolt Universal at 210 deg. F. and flash- and fire-points of 450 and 540 deg. F. respectively, is admirably suited.

For *light-duty* service and where it is impossible to heat a heavy-bodied product, such as described above, a comparatively light-bodied mineral oil may be used with satisfactory results. For these conditions a dark lubricating oil having a viscosity of 100 sec. Saybolt Universal at 210 deg. F. will give effective results. Such an oil when cold will creep in between the wires and saturate the core; it will, however, require quite frequent applications. When the rope is in continuous service, it may be necessary to apply this light oil every day or every other day.

Methods of Application.—A very important detail of rope lubrication is the method of application of the lubricant.

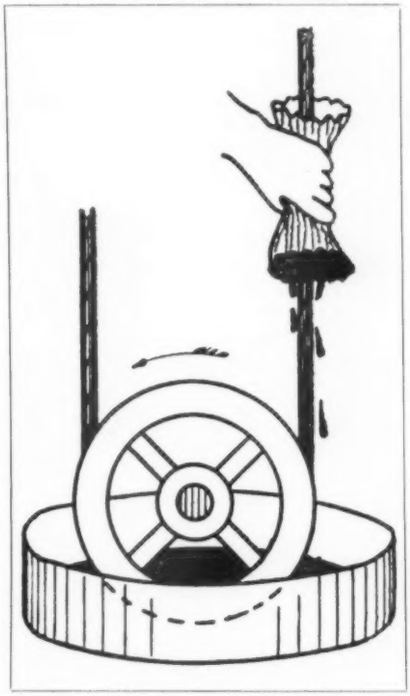

Fig. 8—Bath application for vertical rope, applied at sheave.

While various methods are used, in general they fall into one or the other of two groups: (1) hand oiling; and (2) application by means of some sort of oiling device.

Hand oiling is the most common method, but the least effective, because

much oil is usually wasted and, unless diligently done, the oil is not uniformly distributed over the surfaces and worked into the interior of the rope. If care is exercised, however, the hand-oiling methods shown in Fig. 3 serve, when it is impractical to use a more efficient method.

The oil should be poured in a very small stream on the rope just where it first makes contact with the sheave or drum. In this way the oil is spread and worked, to a certain degree, into the rope. A swab, held as shown, aids in distributing the oil more uniformly over the surface of the rope. As a mat-

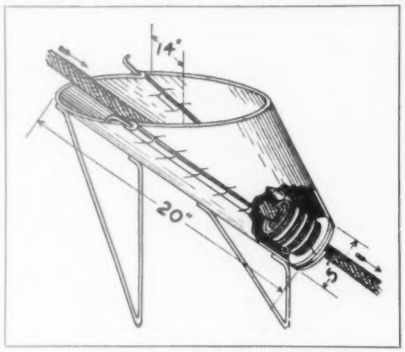

Fig. 9—A metal cone for oiling inclined rope.

ter of safety, the swab should *always* be held on the "off" side of the sheave, because broken wires may catch the swab and pull the hand into the sheave. While cotton waste serves very well as a swab, sheepskin, with the wool side next the rope, is much better. A pan should be placed under the point of application to collect the excess oil as it drips from the rope.

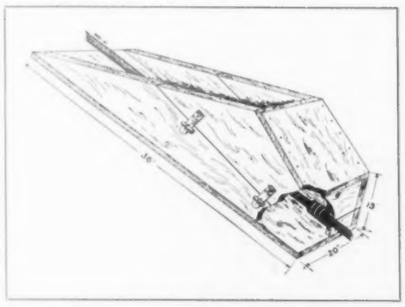

Fig. 10—Wooden box device for lubricating inclined rope.

A brush, a bunch of waste, or a piece of sheepskin, which has been soaked in the oil, may also be used but is not as effective as the above method.

In any case of hand oiling the most important point is to work the oil thoroughly into the rope.

The best method of lubricating rope is to immerse it in a bath of oil, heated to a temperature where it will readily penetrate to the core. After draining off the surplus the internal and external surfaces will be covered with tough oil films which will protect the rope against wear and the elements for a long period of time.

A metal or wooden trough, as shown in Figs. 4 and 5 is easily built and furnishes a convenient and inexpensive means for applying the oil to ropes that run horizontally with slack. The best results are obtained by running the rope through the oil-bath slowly, as more thorough lubrication and greater penetration are secured than if it is run through at a higher speed.

For vertical ropes the devices shown in Figs. 6 to 8 will be found efficient and convenient. The devices shown in Figs. 9 and 10 are also suitable for inclined ropes.

In all cases it is important that the rope be thoroughly cleaned before applying the oil. This may be done best by soaking in kerosene or gasoline for a few hours and then scrubbing with a stiff wire brush. A little extra time spent in preparing the rope for the oil will add weeks to the life of the oil films, thereby reducing the number of applications and the quantity of oil.

Between the invention of wire rope and the time when any real attempt was made to lubricate it effectively nearly a century passed. Modern wire rope is a high-grade product and its manufacturers realize that it is false economy to use it without correctly lubricating it. But, there is no greater common fault in its use than allowing it to run with insufficient lubrication. Too many users still remain to be convinced that regular and correct lubrication increases the useful life of rope. They have the erroneous idea that the cost of lubrication is just so much money wasted, in spite of the known fact that the service a rope will render varies with the kind of lubrication it receives.

Fuel Economy

(*from page 42*)

consumption per barrel of cement include the maintenance of uniform operating conditions, the use of enlarged clinkering and calcining zones, the greater skill of kiln operators, and economy in the consumption and generation of power at cement plants.

"The present rate of energy consumption," the report concludes, "leaves a wide margin for additional economies. These can be achieved both by improving the performance of plants consuming more fuel than is required at more efficient operations and by reducing the margin between the actual performance of the best plants and the theoretical attainable maximum.

"Future savings are attainable both by wider use of techniques and equipment already effectively applied, and by the successful commercial adoption of new technical improvements and ideas. The rate at which further technical gains will be won, however, will be governed by the trend of such economic factors as fuel prices and cement production, which determine the money value of the savings and whether they will pay for additional equipment."

Among new heat-reclaiming devices now being developed to which the report called attention is the Lepol kiln, already in operation in a few places in this country and abroad. The authors of the report believe a substantial rise in fuel prices probably would encourage its more widespread use.

This kiln was developed in Germany about 1930 and first installed at San Sebastian, Spain. The first kiln of this type installed in the United States was at the plant of the Spokane Portland Cement Co., where the coal consumption was reported to have dropped from 100 to 46 lb. per bbl. of clinker.[3]

The fundamental change in the Lepol kiln is the installation of a traveling grate in a chamber beyond the upper end of the kiln. As the grate conveys the raw mix toward the kiln, the hot kiln gases are sucked through the layer of raw material, evaporating its moisture and calcining the surface particles.

To increase the transfer of heat the raw meal is first formed in small balls (nodules) by being dampened and rotated in a drum for that purpose. As the balls are in contact with each other only on very small surfaces, the particles are thoroughly exposed to the gases and the upper portion of the layer may be calcined to a considerable extent. In addition to its fuel economy, the Lepol kiln is credited with reducing dust losses and making a clinker particularly suitable for grinding.

The conclusion drawn by the report is that the possibility for further fuel economy in cement manufacture depends upon technological potentialities, the outlook for production, and the course of fuel prices.

"Production recovered sharply in 1936 and 1937," the report observes, "from the low points of immediately preceding years. If these gains can be retained, and especially if fuel prices continue to rise—as they have in the past four years—increased investments in fuel-saving equipment are sure to be made."

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[3] See also Trauffer (W. E.).—*Operation Improved at Spokane Plant.* PIT AND QUARRY, July, 1938, pp. 69, 73, 75. Also Trauffer (W. E.).—*Lepol Kiln System Heads List of Improvements at This Cement Plant.* PIT AND QUARRY, January, 1936, pp. 80-8, 90.

The attractive Engineering Building in which the laboratory is housed.

N.S.G.A. Carries on Research Work in Completely-Equipped Laboratory

THE establishment of the National Sand & Gravel Assn. Research Foundation at the University of Maryland marks an important step in the research program of the association. While it has had laboratory facilities previously and has been responsible for much worth-while research during the past decade, the new arrangement makes possible the conduct of work on a more comprehensive scale. The proximity of this laboratory to the new Eastern Experiment Station of the U. S. Bureau of Mines (*P & Q*, Nov. 1937, p. 55) is also important. Both the laboratory and the station are located on the campus of the university at College Park, Md., about 10 mi. northeast of Washington.

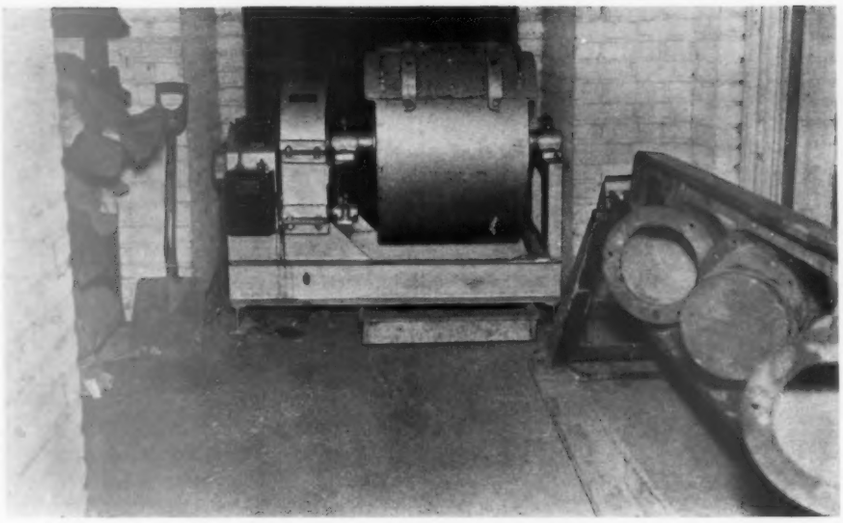
The agreement between the association and the university (reported in the December, 1937 issue of PIT AND QUARRY) became effective on January 1 of this year. Since that time the laboratory equipment has been removed from its old quarters in the Munsey Building in Washington and installed at the university. New equipment has been purchased or built and installed and a considerable volume of investigational work has been put under way. Stanton Walker, director of engineering of the association, has general charge of research activities, carrying out policies formulated for an Advisory Committee including representatives of both the university and the association. Dean S. S. Steinberg, of the College of Engineering, and another representative to be named, represent the university on the Advisory Committee, and Alex. W. Dann and Stanton Walker represent the association.

The accompanying photographs show that the laboratory is well equipped and housed in spacious and attractive quarters. Three machines are available for strength tests of concrete and other materials—two 100,000-lb. universal lever type machines and one 300,000-lb. (60,000-lb. tension) hydraulic machine. For abrasion tests of aggregates there are two machines—the Los Angeles Rattler, which has recently come into such widespread use, and the time-honored Deval abrasion-testing machine.

The laboratory is well equipped for carrying out work requiring a controlled temperature of 70 deg. F.—for curing concrete and mortar specimens and the conduct of accelerated soundness tests of aggregates. A small constant-temperature room is equipped with cooling and heating units, automatically controlled, which will maintain the desired 70 deg. level within 1 deg. under the most severe conditions. Other equipment shown in the photographs includes that commonly found in construction-materials testing laboratories—sieves and a sieve shaker, riddles and a riddle shaker, a briquette-testing machine, miscellaneous forms and molds, scales and balances, measures, the usual glassware, supplies of cements and aggregates, etc.

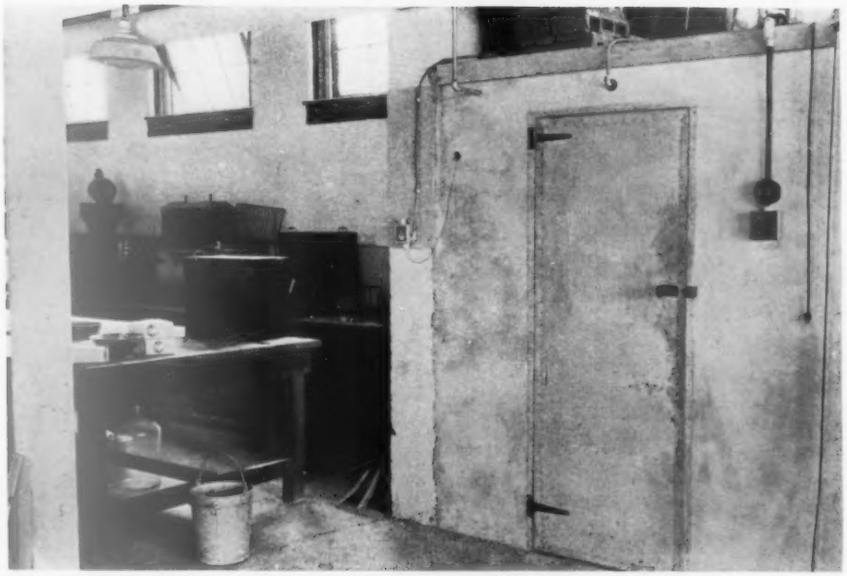
In addition to a considerable amount of special testing for member companies a number of formal investigations are under way. Those being conducted at present, or which are in immediate prospect, according to Mr. Walker, are: (1)

Attendants at the recent directors' meeting of the association visit the laboratory. Back Row—J. F. Berger, Stanton Walker, W. A. Bliss, V. P. Ahearn, Anderson Dana, G. W. Renwick, M. A. Neville, S. A. Phillips. Front Row—J. R. Hill, John M. Neville, H. V. Owens, H. P. Caldwell, H. S. Davison.

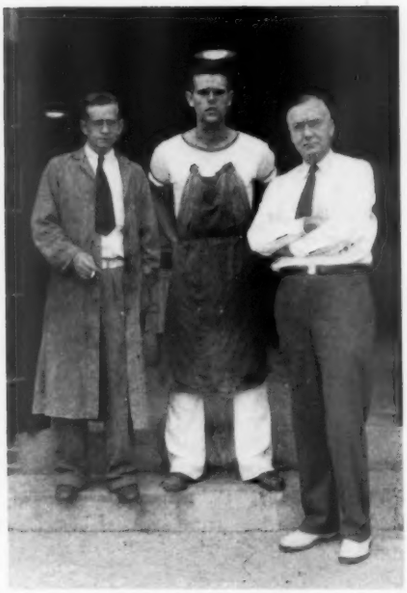


The Los Angeles Rattler and, at right, the Deval abrasion machine.

Dial scale, riddle shaker and some of the aggregate-storage facilities.



The moist closet, with mercury-contact remote-control thermostat at left.



Left to right: Assistant Brum, senior student Wm. Davis, and Stanton Walker, director of engineering.

A preliminary study being carried out in coöperation with the Eastern Experiment Station of the U. S. Bureau of Mines. It involves the determination of the modulus of elasticity of concrete by sonic vibrations. The association's cooperation with the bureau in this instance consists of manufacturing concrete specimens to be included in its broader study having to do principally with stone columns. The bureau is anxious to include concrete, because of its increasing importance as a material used in mine structures.

The association's interest in coöperating in this work is threefold: (a) it may be helpful in leading to the greater use of concrete in mines; (b) additional information on the modulus of elasticity of concrete will be valuable; and (c) the investigation points the way to some proposed studies of soundness of concrete and aggregates which may be of extreme value.

(2) An investigation of the mortar-making characteristics of sand. In addition to strength determination, studies of resistance of the specimens to alkali solutions will be carried out. Specimens of "constant water-cement-ratio" mortars and 1:3 mortars for both compression and tension, comprising about 3,500 specimens, will be made, using 16 different gradings of Potomac River sand and 25 or 30 miscellaneous sands, graded as received, from different parts of the country.

The principal objectives of the investigations are:

(a) A study of the significance of the A.S.T.M. Standard Method of Test for Structural Strength of Fine Aggregate Using Constant Water-Cement-Ratio Mortar (A.S.T.M. Designation: C 87-36) as an acceptance test for sands.

(b) A study of the effect of the grading and quality of sand on the compressive strength of mortars.

(c) A study of the effect of the grading and quality of sand on the resistance of mortars to aggressive solutions. This study is expected, also, to afford information on the resistance of mortars to weathering.

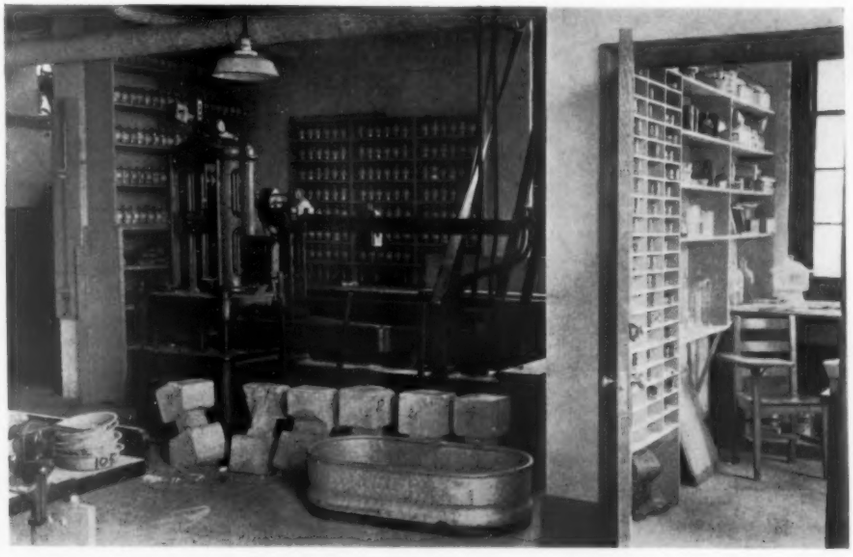
(3) A continuation of some preliminary work which the association has been doing in a study of the adhesion of bitumens to aggregates. Methods for making such studies are not well outlined, particularly in the case of the coarser gradings. The present study represents a search for a readily-made, quantitative method. The present work is exploratory only; it may lead to much or to nothing.

(4) A general study of the physical characteristics of miscellaneous aggregates. It is believed that a good cross-section of information on the resistance to abrasion, the soundness, specific gravity, absorption and other miscellaneous characteristics of aggregates throughout the country will be of great value. Member companies have been solicited to submit samples and particularly those on which good information as to their service record is available.

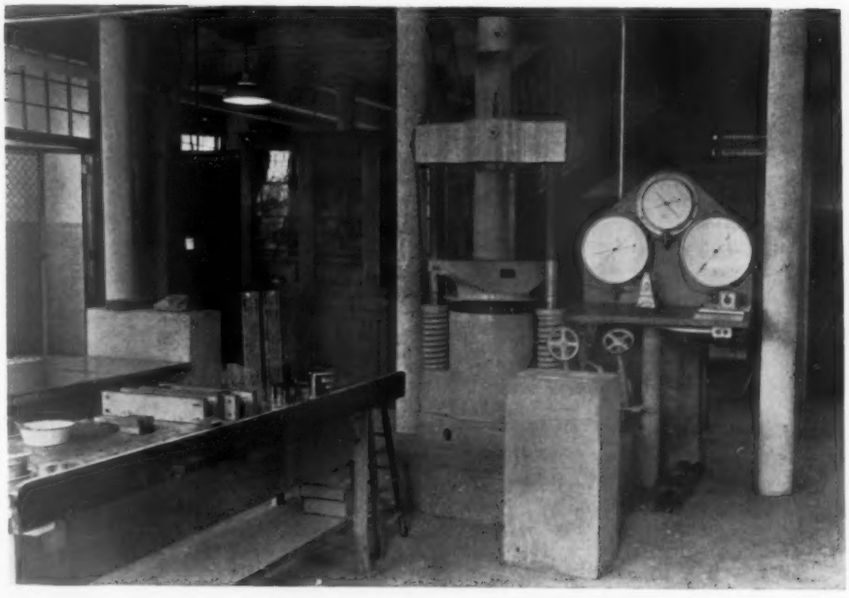
Cooling unit in moist closet. Sprays are at left, above.

While the National Sand & Gravel Assn. Research Foundation is operated by the association, information developed by its activities inevitably accrues to the benefit of the industry as a whole. For that reason it deserves the support of all members of the industry without regard to membership in the association. In a large measure the value of the work must depend on the support which is given it by members of the industry.

The 100,000-lb. compression-testing machine. Briquette tester at left.



The other 100,000-lb. testing machine. Office at right.



The 300,000-lb. compression-testing machine.

Producers Oppose Maximum-Hour Provisions of Labor-Standards Act

This is the final installment of letters to the editor from producers expressing their opinions regarding the new Fair Labor Standards Act, now in effect. The letters were written in direct response to a questionnaire.—Editor.

I HAVE always been in favor of having a fixed minimum wage that is not too high for any industry. In other words, if any industry does not pay at least a living wage, it is of no benefit to the community.

The 25c. an hr. minimum wage is not too high, it should be increased over a period of two or three years to approximately 40c. A permanent minimum of 25c. is too low. It will not affect our company on account of our paying an average wage of 60c. an hr. for our labor.

The 44-hr. week is not too short and I believe in some cases, where they have mass production, it is too long. For the average manufacturer it is just right. It will shorten our working period 4 hr. a week.

The wage-and-hour restrictions should be effective in every industry whether it does business locally or interstate.

The wage-and-hour bill should not be restricted to any district. Where living costs are low, living standards are lower than should be allowed in this country. By paying a living wage and the living standard raised the purchasing power will naturally be increased.

Every industry operating under organized unions is paying over 25c., so I do not believe there would be any difficulties. I do believe the 25c. per hr. minimum is going to create more harmony between employer and employee, for it is aimed to raise wages and standards of living for workers who are now employed at starvation wages.

I do not anticipate any difficulties from this law. I believe we will benefit by it on account of our not having to compete with manufacturers paying wages below the proposed 25c. scale.

After this minimum wage and hour law has been in effect a short time, manufacturers are going to find more demand for their goods. Practically all the things manufactured by mass production are articles purchased by workers. If they are allowed to make a living wage, it will not be long before their home conditions are going to improve.

(Mica—New Jersey)

GENERALLY speaking, I think no exception can be taken to the 25 c. an hr. minimum, although this would depend to some extent upon the character of the business and also the location. It will not affect our company in any way.

We do not think any exception should be taken to the 44-hr. week. It will not affect us at all.

We think the law should be applied to all employers, and that the tendency would be to increase purchasing power.

We do not think the law's operation will improve the relations between employers and workers.

We do not expect to have any difficulty in complying with it.

(Crushed stone—Pennsylvania)

THE minimum pay of 25 c. an hr. is considerably lower than the rate we have held for a number of years, so the minimum rate of pay will not affect us at all.

The 44-hr. week will impose some difficulties on our operations. It is necessary for us to make our plant schedule conform with shipping requirements, and in trying to do this our plant operating hours may vary from 40 to 168 per week. Naturally, we will not be inclined to pay time and one-half for overtime work, so the problem of making the individual worker's hours conform to the law and at the same time enable us to vary our production widely is going to be rather difficult. It would be much better if each man was allowed a maximum number of hours in any one month, quarter, or year.

While this particular plant does not engage in interstate business, we fully realize that it would not be fair to allow us to pay one rate of wages and require a competitor who was near a state line to pay another rate.

We believe that the minimum wage is low enough so no exceptions would have to be made for certain geographical areas of low living standards. In many cases, as in our own, the prevailing wages will be higher than the minimum named in the bill.

The question of whether or not the law will raise the income and purchasing power of workers is very doubtful. In our own case it will probably cut down the wages of our men materially as they now put in more working hours in a week than the law will allow. We have always operated on the theory that since our industry is seasonal, to the extent that not more than nine months comprise a year's operation, the men should be allowed to work longer hours during the season in which we can furnish them with work.

The actions of labor unions are in most cases entirely unpredictable, so we can not offer an opinion as to whether or not the new law will increase or decrease labor disputes.

Difficulties resulting from the enforcement of the law will be mainly in adjusting the workweek to meet production requirements as was explained above.

(Sand and gravel—Missouri)

WE do not think that the 25 c. per hr. minimum for labor is too low nor too high, although in 1932 we paid some Negro labor, working out in the country, less than 25 c. per hr. Our minimum pay to-day is 30 c. per hr., and we do not believe that the wage-and-hour law will affect us in the matter of wages. However, should it become effective against our company, it would materially affect us on the number of hours worked as we work ordinarily on the 10-hr. basis 6 days per week, and sometimes more than that on a peak day during our heavy season. Our business consists primarily of the production of ready-mixed concrete, sand and gravel, and is affected materially by seasons of the year and weather conditions. This minimum should be set on a yearly basis rather than a weekly basis in those businesses that are seasonal. It would be unfair to penalize an interstate business with the wage-and-hour law, if his competitor were purely an intrastate shipper and would not be subject to this act. We believe that we are in the latter class, and if it comes to a show down, we would hope for this advantage.

As to exemptions from the minimum-wage provisions being made in favor of certain geographical areas we believe that the increase in wages of the South would very shortly increase the cost of living to a basis comparable to the North and East. We are for maintaining that differential so long as it costs more in freight to ship a commodity from Texas to Chicago than it does to ship the same commodity from Chicago to Texas. We have no desire to start a controversy, but we feel that the tariff policy has also been against the South, and think that these discrepancies should be removed before equalization of wages takes place.

We do not see how enforcement of this law would raise the income or purchasing power of the workers unless they are now paid considerably less than the minimum; the limitation of hours is the big trouble with the law as we see it in our industry. We are probably not well-enough informed to make a statement concerning the industries that have the reputation of paying less than the minimum set by the new law.

We have had no labor difficulties and would not feel capable of commenting on the improvement of the employer-employee relationships.

(Sand and gravel—Texas)

PERSONALLY, I think the wages-and-hours law is a very silly one. It might answer its purpose, however, of creating interest on the part of some of the workers to a point where they will lend their political influence. The law does not apply to farmers; hence, it is another one of these class laws which applies to less than half the people. The writer maintains that no Federal laws should be passed which do not apply to all our people, regardless of creed, sex, position, section of the country, etc.

Who knows whether a 25 c. an hr. minimum is too high or too low? Our company has a minimum of 56 c. per hr. We may be compelled to compete with other lime manufacturers who will pay the minimum according to law of 25 c. per hr. Would that be fair and just? It is rather difficult to forecast how this law will affect us without knowing what other manufacturers will do in Ohio or other states who compete with us in the sale of lime and limestone products.

A lime plant is a good bit like a steel mill. After the kilns are put in production, labor is required to provide stone to keep them filled, fired and drawn, and take care of the burned lime 24 hr. a day, Sundays and holidays included. Forty-four hr. do not work out very well, neither do 44 hr. work out well in the rest of the plant. A multiple of 8, such as 32, 40 or 48, would work better. Kilns have to be filled on Saturday just the same as any other day. Forty-four hr. may work out all right for a shirt factory, a silk mill, cotton mill, or in those industries where they can pull a switch, close up shop and forget about the business until the following Monday.

There isn't any fixed rule or law that can be made as to minimum wages, maximum hours, that would not affect us. We can see no advantages to be gained, but can see a lot of hindrances to industry as well as to employees. The main hindrance is the precedent established of regulating by law the number of hours a man can be employed or is to be permitted to work. It may be like tht gasoline tax law, which started with a half cent and has now been increased to 5 or 6 cents. Instead of the money being used as originally intended, it is appropriated for various purposes.

As long as the law is in effect, it should be applied to all manufacturers, regardless of whether they should be at the boundary of the state in which they are located or go across the line, as long as the law applies to those who do business in other states.

If we are going to have a minimum, it should be applied indiscriminately to all producers and workers irrespective of territory.

The law will reduce the purchasing power of the workers on an average. It will increase the operating costs, which means higher selling prices of commodities and the workers will be in worse position than they were before.

It is rather difficult to forecast the effect it might have on labor unions but am rather inclined to believe that it might tend to steal some of the agitators' thunder.

It is the writer's opinion that labor will be dissatisfied, become disgruntled, and that the law, if anything, will tend to reduce the efficiency rather than improve the feeling between employer and employee.

(Lime—Ohio)

TWENTY-FIVE cents an hr. minimum is too high in this part of the country. We believe a man should be allowed to work for whatever wages he determines are satisfactory to him. The law will affect our company seriously.

Forty-four hr. a week in some cases are entirely too short a time. At the present time the 44-hr. week will not affect our company, except during seasons where our work requires very long hours.

We do not believe that the wage-and-hour law should prevail anywhere. We have a God-given right, which is to earn our bread by the sweat of our brow, and furthermore, we believe in state rights.

This is a large country and a wage that is fair in one section is not fair in another. There certainly should be geographical exceptions.

We believe if the law is enforced the income and purchasing power of the worker will be lowered.

The relation in our part of the country between our labor and employers are perfectly good and agreeable to-day. Interference by Federal authority will cause trouble.

Enforcement of the law by the Federal authorities will cause friction and put upon industry a lot of reports which are useless.

(Phosphate—South Carolina)

I THINK the 25 c. an hr. minimum is a good median and is worthy of a trial. It will not affect our company.

The 44-hr. week we consider too short, especially for seasonal or part-year employees. It will affect our men because they have repeatedly asked to work more than 44 hr. a week in order to compensate for only part-year employment.

The applicability of the law should be determined for the entire industry regardless of state lines. There should be no exceptions for geographical areas, but some exception should be made for seasonal occupations.

The law will not increase the purchasing power of workers, because their productive earning hours will be decreased and their purchasing power correspondingly less.

The law's operation will not improve employer-employee relationships because it will create labor unrest and furnish more time in which to foment discontent. We expect employees to become increasingly insistent in their demands to work more than 44 hr. so that productive working months, April 1 to October 31, will yield more wages. For example, in the 30 weeks between approximately the first of April and the last of October workers can earn under a 44-hr. limit $528 at 40 c. for each of 1,320 hr. How can it be expected that an employee in a seasonal industry can earn enough in 44 hr. per week to live decently throughout the year? Employees in an industry in which the productive working season is curtailed by causes beyond the control of the employer should be exempted from the 44-hr. week provisions.

(Crushed stone—New York)

THE 25 c. minimum rate is too low for application in the central states territory. The minimum wage prescribed will not affect the pay-rolls of our company, inasmuch as the minimum wage now paid is higher than that required under the act.

Since the sand-and-gravel industry is a seasonal business in the central states, the 44-hr. week is too short to accommodate occasional rush periods occurring during the operating season. A maximum week of 44 hr. would require putting on extra shifts for short periods to avoid paying overtime. Double or triple shifts invariably result in increased labor expense and maintenance costs. Moreover, the regular employees would prefer to work extra time without overtime pay in order to make up for non-operating time during periods of decreased demand.

It would seem fair, from a competitive standpoint, for the wage-and-hour restrictions to be applied on both interstate and intrastate business.

Wherever it can be shown for any cause that the wage-and-hour provisions will actually lower the wage income, it would appear reasonable that exceptions should be made if thereby no undue working hardship would be placed upon the employees.

On account of the fact that there are probably few, if any, producers in the central states paying less than the prescribed minimum wage, it may be assumed that the purchasing power of the workers in our industry will not be increased by reason of the operation of the act.

There is no reason to conclude that the employer-employee relations will be improved under the provisions of the act, nor is it believed that the law will either weaken or strengthen the position of the labor unions.

It may be assumed that the industry will coöperate willingly toward the fulfillment of the purpose and intent of the law, if proper exceptions and exemptions are granted, as provided for under the act, because of the seasonal nature of the business.

(Sand and gravel—Illinois)

IT is our opinion that the 25 c. an hr. minimum will not affect us in any way, because our wage scale minimum now is higher than that. At the present time the minimum ranges from 40 to 45 c.

I have not read the law and do not know what the provisions are for overtime, if any, so can not say whether on extra overtime charges it will affect us or not. If those provisions are in the law, it probably will.

The 44-hr. week in the abstract is probably all right. Applied to a seasonal industry, where for a period of perhaps 30 days it is necessary to crowd production to finish one or more specific jobs, the hour restriction would interfere.

A situation like this could probably be handled by putting on an extra shift. Stone plants are often located in small communities and it is difficult to bring in enough men for an extra shift for a short period.

I do not think this law will raise the purchasing power of workers in this territory. It will increase the cost of production of materials.

When a workman, able and willing to work, is forced out of employment because of temporary economic conditions, some provision for the sustenance of him and his family must be immediately provided.

(Crushed stone—Ohio)

THERE are times in American business when a maximum workweek established by law will be detrimental. If hours of employment could be adjusted for groups of related industries for a period of 90 to 120 days, the condition could be more equitably handled. This would mean flexible hours to fit conditions immediately at hand. This could be accomplished by boards consisting of government and industry to plan the hours of work for the next three or four months, and continuing to do so at such regular intervals. Thus, if an error is committed, it will not extend for too long a period.

In this manner in the depth of a depression work could be provided for everybody by cutting the work hours sufficiently, thus averting dire want by spreading the load among all workers. The employer would necessarily be paying his share of the bill because of the disruption of labor conditions. For instance, the steel industry might be shut down completely and the gasoline stations remain open as usual. By cutting the hours sufficiently steel labor might find temporary employment disbursing gasoline. To prevent one industry or a group of industries from having a workday too far out of line with that of other industries it would be the duty of the boards to adjust the relationship between various industries, as, for instance, between steel and oil.

This is going far afield theorizing and the chances are that industries and employees who might be adversely affected under this plan would object so strenuously that the plan could not be put into practical operation unless a careful program of education was first carried on.

An inflexible limit in the maximum number of hours may be a step in the right direction, but in industries like ours, subject to extreme seasonal ups and downs, its application is bound to increase costs.

EXCEPT for the South, I believe the 25 c. minimum is too low. It will not affect our company in any way. It seems to me that 48 hr. are about proper for the week length for our industry as we are now operating on that basis. The provisions of the law should be applicable to the entire industry, although some provision should be made for the South. I think the question of the effect of the law on the purchasing power of workers is debatable. In our judgment the law will not improve the relations between employers and employees. We do not expect to encounter any practical difficulties in our compliance with the law.

(Sand and gravel—Illinois)

TWENTY-FIVE cents per hr. minimum is low. I would rather see it 40 or 45 c. per hr. It will not affect our company.

We can readily adjust ourselves to the 44-hr. week, so it will not affect our company.

We feel that wage determinations should be made for an entire industry.

Exemptions undoubtedly should be made, but very careful consideration should be given before these exemptions are made.

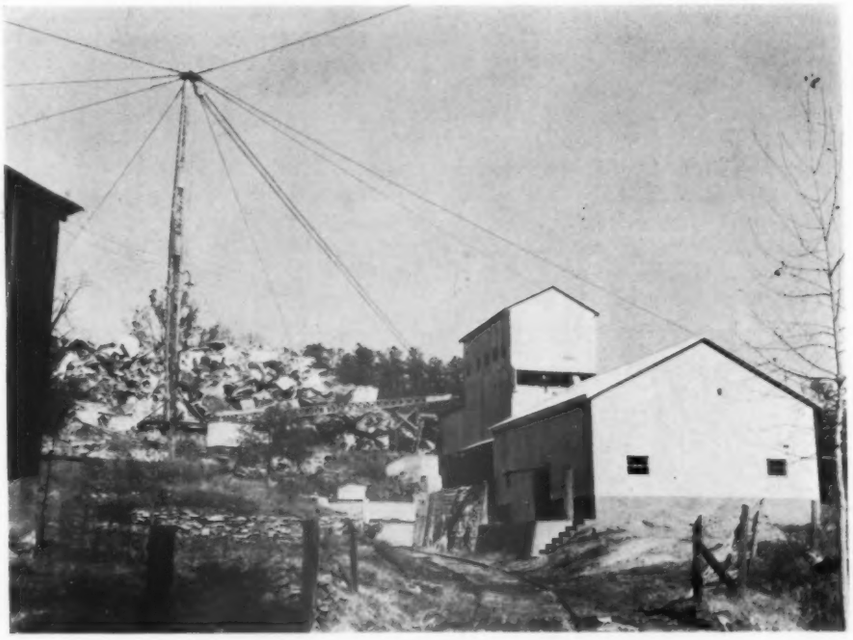
I believe the law will increase purchasing power and that it will improve employer and employee relations. We believe that it will make the worker less discontented with his economic conditions and will reduce labor disputes.

Our company does not see any practical difficulties and we feel that the law can be enforced, although we are going to find operations where they will be continually violating this law. When the N.R.A. started, we thought it might be impossible to comply with the act, but after operating we found it comparatively easy and for this reason there should be no difficulty with the new above law, especially among the better operators.

(Sand and gravel—Michigan)

IN our opinion the 25 c. per hr. minimum set by the law is too low. Nevertheless it will not affect our company in any way. The 40-hr. week provision may be all right, except for seasonal industries such as ours. In any event the law should be applied to an entire industry on a uniform basis. There should be no exemptions made in favor of certain geographical areas. We do not believe that the purchasing power of the workers will be much increased by the operation of this law, nor do we believe that the relations between employers and employees will be improved. We expect to encounter plenty of practical difficulties as a result of this enforcement.

(Lime—Pennsylvania)



At the left is the dimension-stone quarry of the Inkley concern. Below it is the terrazzo plant with stiff-leg derrick at the left.

Marble Waste, When Crushed to Terrazzo Chips, Yields Profit

THE waste stone which accumulates in a dimension-stone quarry is always a problem. If allowed to remain in the quarry this stone hinders operations and it can only be removed at considerable cost. Many quarry operators have solved their problem by using this stone in the manufacture of lime, roofing granules, crushed stone or other products, depending on the nature of the stone.

Thomas Inkley, manager of the Inkley Marble Quarries, was faced with this problem and his solution was the erection of a small but modern plant for the manufacture of terrazzo chips. This plant went into operation in September, 1938. Its products are dust, chicken grit and No. 1, 2 and 3 terrazzo chips. When producing these materials the plant has a capacity of about 60 tons in 8 hr.

This operation is located at Marlo Station, 4 mi. west of Ste. Genevieve, Mo., on the M. & I. Rwy., a branch of the Missouri Pacific Rwy. This quarry was originally opened in 1921 and was taken over by the present owners in February, 1936. This marble is said to compare favorably with Italian marble and has been and is being used in many important structures in this country. Among the many buildings in which this marble was used are the Library of Congress in Washington, the Queens County Court House in Jamaica, L. I., and the City Hall, U. S. Post Office and Southwest High School in Kansas City, Mo. Both the dimension marble and the terrazzo are sold through Colonna & Co., Inc., New York, N. Y.

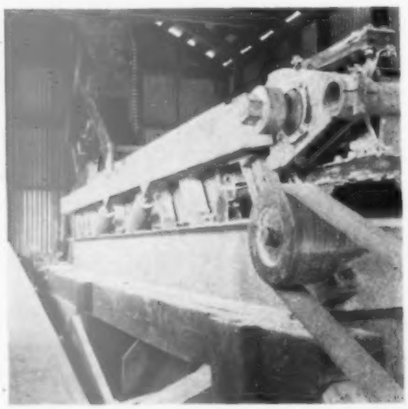
Only the high-grade marble waste is used for terrazzo. The overburden spalls or weathered rock, which is removed before the marble cutting begins, is used for road stone. The largest of the waste stone is broken by mud-capping and is loaded by hand into steel pans, which are lifted out of the quarry by a stiff-leg derrick with a 75-ft. boom. The stone is dumped on a pile or into the plant hopper. A 30-in. by 5-ft. apron-feeder discharges the stone into the Size 30-22 American ring-roll crusher. The stone is hand picked for color on this feeder. The crusher product is carried by a 32-ft. inclined belt-bucket elevator to a 3-ft. by 10-ft. Nordberg-Symons double-deck screen. The decks of this screen are so arranged that dust and four sizes of coarse material can be produced. The oversize material drops on an 18-in. by 22-ft. horizontal belt-conveyor which returns it through a spout to the crusher-feed hopper.

The products of the screen drop into a six-compartment bin of 120-cu.yd.

The belt conveyor which withdraws the finished product from the storage bins. Crusher in background.

The ring crusher which grinds the material and the pan-feeder which supplies it with stone.

total capacity. Material is discharged from these compartments on an 18-in. by 34-ft. horizontal belt-conveyor which feeds a timber hopper in the sack-loading and storage building. Sacks of 100-lb. capacity are loaded from spouts



All sizing is accomplished on this double-deck vibrating screen.

at this hopper. The floor of this building is on a level with the floors of box-cars on a siding alongside in order to facilitate trucking the loaded sacks into cars. Truck shipments of chips are also made to points within a few hundred miles of the plant. This building has a storage capacity of 2,000 tons of sacked material. Arrangements have also been made so that dust can be loaded from the storage bins into trucks. Farmers use this dust for liming their soils.

By changing the screen openings and adjusting the crusher road stone is produced from the overburden spalls. The plant has a capacity of 60 tons per hr. of this material.

The entire plant is operated by a Brownell 75-hp., 273-r.p.m. steam engine using steam from the boiler of the dimension-stone plant. This engine drives direct, through a flexible coupling, a shaft which is supported by three Medart bearings. The crusher is driven from this shaft through a Conway clutch and a Manhattan "Condor" V-belt drive. The crusher feeder is driven by belt and chain from the crusher shaft through a clutch. A flat belt from this main shaft drives another shaft above from which the remainder of the equipment is driven. The elevator is driven by chain and the return conveyor by a flat belt. A third shaft is driven by a flat belt from this shaft. The screen and the conveyor under the bins are driven through flat belts from this third shaft.

All the equipment for this plant was supplied by the American Pulverizer Co., which made the crusher and pan-conveyor. The plant was designed by the engineering staff of this company in coöperation with Herman Weiler, the marble company's superintendent. The screen was made by the Nordberg Mfg. Co., the conveyor and elevator belting were made by the Cincinnati Rubber Co. and the conveyor idlers and pulleys by the Link-Belt Co. Chain Belt buckets are used on the bucket elevators.

All the heavy equipment is supported on concrete piers and footings and all the pits are lined with concrete and have natural drainage. The building has a wooden framework and is inclosed with galvanized corrugated-metal siding and Pittsburgh Steel Co. "Suredrane" metal roofing. The bins are constructed of solid 12-in. by 12-in. oak timbers with decking of 3-in. by 10-in. oak laid edgeways.

Sand and gravel are excavated hydraulically at this plant operated by R. J. Creman at Curtis Bay, Md. A Caterpillar Diesel engine drives a Platt triplex pump which delivers 500 gal. of water per min. at high pressure to dislodge and bring down the material.

LIME PRODUCTION PROBLEMS

BY W. R. CLIFFE

• • •

Lining the Rotary Lime Kiln—Part II

AMONG rotary-kiln operators there is probably no more controversial subject than that of the 6-in. versus the 9-in. hot-zone liner. The thought that the inner 2 or 3 in. of the 9-in. rotary-kiln liner is lost early in its life and that it is the back 6 in. which accounts for the greatest percentage of the total life is entertained by many. Also the old idea that heat in the burning zone must get away easily has led many to try the 6-in. liner which, at a little more than two-thirds the cost of the 9-in. block, seems at first glance to be pretty attractive. Furthermore, in installations in which pinching of the inner face of the brick occurs practically the same life has been derived from the 6-in. liner as from the 9-in. However, if the lining is properly placed, and the other factors hereinbefore described which have a tendency to "pop" the inner end of the block are corrected, the 9-in. block will in the long run be substantially the more economical refractory to use.

By using a long piece of ¼-in. or ⅜-in. ordinary iron pipe, connected to the air-line by a light rubber hose, operators can remove the accumulation of lime dust which adheres to the shell of the kiln over the burning zone, and by doing so every two or three weeks accomplish more to favor high conductivity than by resorting to the 6-in. liner.

Intermediate Zone.—The lining of the intermediate zone of the rotary kiln is generally considered as that section which is not subject to the high heat of the burning area nor the abrasion of the rolling charge in its raw state. Ordinarily high-heat-duty fireclay bricks are well adapted to this service, especially when hard-burned. The hard-burning seems to increase the toughness of the lining, and as the rolling charge loses much of its original angularity through attrition and assumes a slight exterior calcination, serious erosion of the bricks is not usually experienced. However, spalling will sometimes occur, as in the case of the 175-ft. kiln whose designer, when preparing the stress sheet, quieted his conscience by stating that he was "approaching" the limit for the two-bearing kiln. This zone comprises approximately one-half of the lining of the kiln and occupies the section exposed to that "between-bearing lash." Critical frequency occurring at certain rotation speeds has been known to reach 2 in. of eccentricity, and it is difficult to imagine a more abusive action on refractory liners. Under such circumstances spalling resulting from pinching is more pronounced if the bricks are extremely hard-burned.

In some of the earlier installations the bricks were placed in two courses. A block 8 in. by 8 in. by 4 in. thick was placed against the shell and the orthodox 6-in. liner placed on the top. It is possible that those who conceived this idea had in mind the economy of the replacement of 6 in. of lining rather than the full thickness, assuming, of course, that the repairs were to be made before the outside 4-in. backers had been damaged. However, as such a method has the advantage of greater flexibility than the use of the single block, such linings exposed to "shell lash" have been known to remain in constant service for more than ten years. The double lining is not in general favor probably because of the added difficulty in placing it. Nor are the single-thickness intermediate linings lasting as long. This, however, may be attributable to greater tonnage requirements, which would naturally be followed by more severe service conditions.

Where "shell lashing" is not present and because of the lesser possibility of rapid temperature changes, the placing of the liners against the shell proper by cutting out for the rivet heads is not necessary in the intermediate zone. Rather, a mixture of one part of Lumnite cement to four parts of old fireclay brick material, which has been crushed to a fineness of minus ¼ in., including the dust of fracture with water added to bring it to a firm consistency, makes an ideal backing. When placed to a depth slightly greater than the height of the rivet head, the block will not only be solidly and evenly supported, but the mass will retain its original form in any temperatures experienced in this area.

Cold Zone.—The cold zone is a misnomer for that section of the rotary kiln where the stone feed is first exposed to the exit gases. In very short kilns temperatures at this point reach and even exceed 1,600 deg. F., and as this is within the disassociation range it should hardly be referred to as "cold" even by comparison with the temperatures found in the burning zone. Possibly the name is taken from the condition of the stone. At any rate the temperature to be experienced is worthy of consideration when choosing a cold-zone block. However, by far the most important factor is the ability of the brick to resist the abrasion of the rolling charge. Toughness is the prime requisite, with evenness of burn exemplified in the old axiom that "a chain is only as strong as its weakest link." Many a feed-end lining has failed because one block of soft-burn has worn through to the shell, thus allowing the entire lining to collapse, while a very great percentage of the blocks could have withstood many additional months of exposure. It is the exception rather than the rule when a feed-end lining wears down evenly, due often to irregular burning of the refractory blocks.

The density of the bricks is likewise important. Cold-zone liners are subject to the moisture of the stone feed which may be of natural origin, a result of washing or of conditions brought about by winter weather, but under whatever circumstances, minimum absorption is essential.

So much has been heard from time to time concerning the spalling characteristics of silica bricks when exposed to rapidly-changing temperature conditions, that some hesitancy has attended the placement of silica linings in this area. As it is almost impossible to bring about a temperature change of sufficient severity to induce spalling in this section, and in view of the well-known resistance to wear of this type of refractory, serious consideration should be given to it. At the time of placement much can be done to prevent or reduce spalling. Metal gages should be used to insure evenness of the joints. By having a small piece of 22-gage (.0313-in. U. S. Standard) sheet metal bent to the proper angle of the top corner of the brick and fitted with a small ring or handle for ease of handling, the gage

can always be laid on the last brick placed, and as the next block is settled into its final position, the gage is removed and placed thereon. This technique requires that fireclay be used only on the lower third of the bricks and applies to girth as well as longitudinal joints.

The diameter inside the lining, the size of the stone feed, the kiln's rotation rate, the kiln's inclination, the position of the feed pipe, and the heat exchangers all have important influences upon the life of the feed-end lining, but time and space do not allow of their individual consideration.

Cold-zone or feed-end and intermediate linings are of increasing importance in view of the tendency to increase the length of rotary kilns. In such installations the length of the burning zone has not increased, so it naturally follows that the other two sections have, and, therefore, lining costs per ton of material produced increase proportionally to the length.

Insulating the Lining.—The insulating of refractory intermediate and cold-zone linings in rotary kilns has been common practice in the cement industry for several years, but it has only recently been applied in the more modern lime kilns. There remains no doubt concerning its ability to minimize heat losses attributable to conduction. However, the more practical question of how the heat thus conserved is ultimately utilized is interesting and, of course, important, if the prime purpose in placing the insulation is economy of fuel.

Attempts to insulate burning-zone linings, where temperatures in excess of 2,400 deg. F. are carried, have generally failed. Two separate factors seem to militate against the success of insulated high-alumina burning-zone linings in rotary kilns. There is, of course, the question of physical strength in the insulating backing at the temperatures to which it is exposed in service. As the kiln blocks wear thinner, the temperature at the interface between them and the insulating backing naturally approaches the operating temperature of the kiln, which in the burning zone usually exceeds the recommended temperature limits for the materials which have been used with some degree of success for the insulation of the feed ends. Beyond their recommended temperature limits the insulating materials begin to shrink or disintegrate and this naturally causes the refractory lining to loosen.

Another question arises from the fact that in examining high-alumina kiln blocks which have been in service in an uninsulated lining a zone of penetration is usually found near the hot face of the lining with a rather clear line of demarcation between the affected and the unaffected portions of the refractory. The depth of this zone is naturally influenced by the operating temperature of the kiln, and the line of demarcation apparently occurs at that point on the temperature gradient from the hot face of the block to the cold face of the block beyond which the glassy phase does not exist. The effect of an insulating backing is, of course, to decrease the abruptness of the temperature drop through the refractory and therefore to increase the depth of penetration of the liquid phase at any given operating temperature.

The insulation of magnesite burning-zone linings has not been successful to date, apparently for purely mechanical reasons. The magnesite linings are of course heavier than the high-alumina linings, their inherent thermal expansion characteristics naturally impose severe stresses on any insulating backing, and the higher termal conductivity of magnesite naturally makes for higher interface temperatures for any given hot-face temperature and combination of thicknesses. To generalize very roughly, the mechanical strengths of the commercial insulating media decrease with increasing insulating values. The solution may be found in the use of a backing having exceptional mechanical strength, even at some very substantial sacrifice in insulating value.

However, insulation has been very successfully applied in the intermediate and cold zones.

When laid in the conventional manner, the regular liners are allowed to extend through the insulation on the quarters and rest against the kiln shell. Naturally, the quarters support blocks must be additionally deeper (equivalent to the thickness of the insulation) than the block backing on the insulation. Considerable masonry work is involved in this process, and the progress of placement of the full lining is much retarded. Where openings, such as sampling ports or manholes, occur, regular deep blocks must be placed against the shell, otherwise the insulating material will work out and thus weaken the inner lining. There, again, rivet heads are troublesome, and great care must be exercised in order to obtain an even depth of insulating backing to prevent the latter from working and possible failure of the lining. It is especially important at the time of placement that the tightest possible work is obtained, as the best insulating material is none too firm, and the regular lining has been known to settle away from the insulation by as much as 6 in. Such difficulties are more likely to occur in kilns of large diameter.

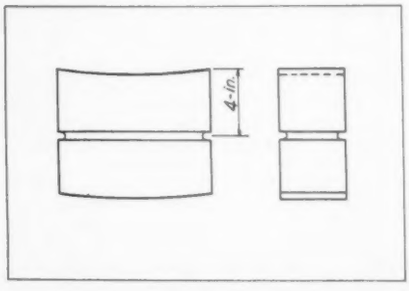


Fig. 4

The inclusion of insulation will add about 50 per cent. to the labor cost of placing the lining, and, in addition, will increase the total cost by some 60 c. per sq. ft. However, if provisions for utilizing the heat thus conserved are available, it is worth many times the initial outlay.

Extra-Width Closure Bricks.—A point of frequent trouble, both to the masons engaged in placing the lining and in possible future interruption in operation due to failure, lies in the closing of a section where the new refractory meets the old lining. If the area to be closed could always be measured in multiples of the width of the brick, there would be no trouble, but that rarely happens. In such cases the masons have two options. They can either reduce the width of an entire course of brick by laborious methods, or place the last full course and form a closure using any of a wide variety of plastic refractories. The latter method is not recommended for reasons too numerous to mention. A simple, sure way of providing for the closure is to carry in the inventory a supply of extra-width blocks of each type used. Bricks of 4½-, 5- and 6-in. widths are recommended. Then as the mason approaches the closure, he can, by varying the widths of the last few courses, usually close out with a neat joint.

Placing the Key Brick.—As the closure (such as described in the preceding paragraph) is made, the final or key brick can never be larger than the top of the opening which remains. Therefore, the key can be nothing more than a straight-sided liner, which naturally eliminates the much-desired and necessary wedge shape. An easy way to overcome this difficulty is to dress a groove or gutter on all four sides of the straight-sided key as shown in Fig. 4. Pour enough air-setting high-temperature cement, that has been thinned to the proper consistency with water, into the opening that is to receive the key, and then drive the key home. The lower extremity of the brick will displace sufficient cement so that it rises and runs into the groove, thus binding it solidly in place for a period equal to

the life of the remainder of the same lining.

Nose and Tail Bricks.—The design of the nose and tail bricks is important, and, because of insufficient thought, much difficulty is experienced. There is a general tendency to make them quite large, and, as a result, much is sacrificed in the service secured. Tail bricks are rarely exposed to direct flame impingement. However, radiant heat, to which they are subjected, is often quite high. It is a common belief that, because they are not exposed to the same severe temperature treatment as the liners in the burning zone, medium quality fireclay bricks of the alumina-silica class are often used, while factually the function of the tail bricks is of equal importance and deserves equal consideration. The following outline discusses some of the variables that should be provided for in the selection of bricks for this location.

1. An important difficulty originates with the kiln manufacturer who does not give proper consideration to the importance of the design of the reinforcing and retaining plates at the discharge end of the kiln. All too often the kiln after a few years of service goes "out of round" at this point, and, under such a state, it is extremely difficult, if not impossible, to lay the tail blocks with even radial planes in order to prevent pinching, and this ultimately leads to disintegration.

2. Cast-iron retaining plates are in general use. Swelling and distortion allow dislocation of the tail bricks. The approximate analyses of metal recommended for this service are T.C. 2.98, Mn .36, P .361, S .095, Si 1.41, Ni 5.15, Cr 1.55, Mo nil.

3. Making special shapes large and burning them hard often results in blocks with wavy planes and interior laminations. In such instances masons usually resort to "mudding." An uneven job results with ultimate tail-brick failure.

4. Tail bricks are invariably exposed to a greater temperature variation than any other refractory in the entire kiln. When ordinary fireclay bricks are used, spalling is inevitable.

5. Tail-brick failure is seldom considered sufficient cause for a shut-down, and the loss of refractory protection often aggravates conditions to such an extent that the kiln shell becomes permanently flared, after which it is never possible to hold a tail-brick set in rigid position.

6. The rolling and pounding of large pieces of fire or scale ring which have broken loose seem to have a more damaging effect on the larger tail bricks, possibly because of the broader surface exposure.

The best solution to trouble at this point seems to lie in proper kiln-shell and retainer-bar maintenance, and the use of the regular-size burning-zone blocks in place of the typical large tail bricks.

Much the same is true of the large special-shaped nose blocks at the feed end of the kiln. These blocks are usually supported by heavy cast-iron segmented plates which, even though protected on the kiln side by refractory, are drawn backward by heat convection. This warping eliminates completely a backing for the brick and results in ultimate nose-shape failure.

Whereas the tendency in tail shapes is to length with a rather large cross-section, nose blocks are usually made high (to retain the stone charge) and narrow. At any rate the common fundamental weakness lies in "oversize." Many of the service problems of the tail bricks are not present in the nose blocks, which simplifies the construction of a corbel from standard 6-in. and 9-in. rotary-kiln bricks of the typical cold-zone class. Such corbelling, when properly placed, will, in spite of its exposure to excessive wear, outlast the cold-end lining.

In some of the newer installations, where exit-gas temperatures range below 700 deg. F., practically no problem exists, as the temperatures are well within the range of soft steel. In such cases the extreme feed end is plated with ordinary soft steel, leaving only the desired opening, which construction lends itself to a perfect nose-brick or corbel backing.

Rotary Kiln Hoods, Settling Chambers and Stacks.—The possibilities of refractory concrete for use in kiln hoods, settling chambers, and stacks should be of interest to operators of rotary plants. As a first complete installation, or in patch repairing, the idea is equally practical. Most plants have equipment available for the reduction of old fire-bricks to the suitable size. Refractory concrete differs from ordinary concrete in that all the fines of fracture are retained. Great care should be taken to insure the presence of 100-mesh material to the extent of not less than 20 per cent. If the dust of fracture does not reach this figure, use fireclay for make up. Of course, the maximum size of the broken brick particles depends upon the thickness of the work to be done. One and one-half inches is ideal for a 6-in. to 9-in. lining in the settling chamber or stack. However, if the material is to be applied by a cement gun, a maximum size of ¼ in. is preferable. Care should be taken to cure by spraying with water for 10 or 12 hr. after placing, and several days should elapse before exposing to heat, and then the more gradually, the better.

Such refractory exposed to moderate temperatures of 1,600 deg. F. and under will give satisfaction equal to brick at considerably less cost. A sack of Lumnite cement usually can be had for $2.25, and by adding 4 parts of broken fire-brick approximately one-quarter ton of material is obtained. Assuming the old bricks to be of no value, the ultimate cost of this type of insulation is about one-fifth that of ordinary fireclay bricks.

Care should be taken not to mix the several types of brick found in a rotary kiln because of their distinctly different characteristics.

[The writer acknowledges with thanks the able assistance of W. F. Rochow of The Harbison Walker Refractories Co. in the preparation of this article, but does not mean to imply that Mr. Rochow agrees with all the statements contained herein.]

Quarry No. 1 of the Columbia Quarry Co., located near Columbia, Ill., completed its sixth consecutive year on September 22, without a lost-time accident. During this period there was a total of 1,148,134 man-hours worked with an average working force of 110 men, producing 2,009,380 tons of crushed stone. The company has just been notified that the "Explosives Engineer" trophy is to become its permanent possession due to winning first place in the National Crushed Stone Assn. safety contest for three consecutive years. The men in this picture are shown gathered about the plaque.

Personal Mention

CONRAD C. MILLER, formerly purchasing agent at Nazareth, Pa., has been placed in charge of real-estate holdings and assigned to other special duties by the Pennsylvania-Dixie Cement Corp. Other changes: W. L. PEARSON has been appointed general purchasing agent. C. F. FEHNEL will serve as his assistant. W. JESS BROWN will supervise local purchases at the Chattanooga office.

BRUCE P. SMITH has been appointed vice-president in charge of sales for the Dart Truck Co., Kansas City, Mo. He will make his headquarters in Chicago, retaining the same offices at 520 N. Michigan Ave. He was formerly Chicago manager for the Western Wheeled Scraper Co. and its successor, the Austin-Western Road Machinery Co.

STIRLING TOMKINS, for many years vice-president of the New York Trap Rock Corp., New York, N. Y., has been made president, succeeding MORTIMER D. WANDELL, retired. JOSEPH C. DOOLEY becomes vice-president in charge of sales. Both appointments will be effective Jan. 1, 1938.

WILDER A. CHAPMAN has been appointed manager of laboratories for Robert W. Hunt Co., engineers, with headquarters at Chicago.

L. C. BEERS, formerly sales representative in the New England states for the Claude B. Schneible Co., Chicago, Ill., manufacturer of dust-collecting equipment, has been transferred to the Chicago office to serve as assistant sales manager.

CHARLES T. BATES of Ada, Okla., has purchased the Tishomingo Concrete Pipe Co., Tishomingo, Okla., from W. H. EHLERS and LEE HARRIS.

W. H. HILDEBRANDT, vice-president of Edison Industries, Orange, N. J., has been named vice-president and general manager of the Edison Cement Corp. W. J. DITTMAR has been promoted to plant manager and G. C. WILSNACK, formerly chemical engineer, becomes his assistant.

H. O. RINEHOLD, plant manager of the San Antonio Portland Cement Co., San Antonio, Tex., has resigned. No announcement has been made regarding his successor.

W. H. KLIEVES, formerly treasurer, has been named president of the Standard Sand & Gravel Co., aggregates and ready-mixed-concrete concern operating in Wheeling, W. Va., following a reorganization and change in management.

DONALD A. ROBISON, treasurer of the Caterpillar Tractor Co., Peoria, Ill., has been named general sales manager. W. J. MCBRIAN, formerly domestic credit manager, is advanced to the post of treasurer.

W. A. BOURGET is manager of the Holden Trap Rock Co., which recently took over the operations formerly conducted by the Worcester Trap Rock Co. of Holden, Mass.

FRED B. HUNT of the Dewey Portland Cement Co. was reëlected chairman of the Cement and Quarry Section of the National Safety Council at the recent Congress held in Chicago.

RALPH J. WATKINS, BURTON E. OPPENHEIM and CAROLL R. DAUGHTERTY have been named as assistants to Administrator Elmer F. Andrews in the work of administering the new Fair Labor Standards Act.

WALTER BRADLEY, 49, engineer for Pacific Coast Aggregates, Inc., was critically injured when he was crushed against the side of a standing box car at the company's gravel pits on Downer Ave., south of San Jose, Cal. He incurred a fractured pelvis, shock and severe hip lacerations.

WILLIS E. TALLEY, 72, president of the Southern Limestone Co. passed away a few weeks ago at his home in Carthage, Mo. He was formerly a St. Louis banker.

NICK GEORGE, 52, was killed recently when a rock slide swept over a bench in the quarry of the Superior Portland Cement Co., a mile from Concrete, Wash. He was knocked from the bench and fell 140 ft. to his death. Other workmen who managed to cling to the bench as the slide roared pass them were slightly hurt.

PAUL A. HOLCOMBE, district sales manager for the Hercules Cement Corp., died at his home in Philadelphia, Pa., on November 3. He was 54 years old, a native of Syracuse, N. Y., and had been connected with the Hercules company for 20 years.

T. WALTER GLASS, New England sales manager for the Universal Atlas Cement Co. for the last 30 years, died at his home in Jersey City, N. J., recently.

WILLIAM W. JOHNSTONE, 50, for several years president and manager of the Olympia Concrete Products Co., Olympia, Wash., died October 8 at his home in that city.

FRANK ZAGELMEYER, 77, president of the Bay City Cast Stone Block Co., Bay City, Mich., died October 13 of a cerebral hemorrhage. He also headed the Zagelmeyer Cast Stone Block Machinery Co.

A. L. MCLAIN, assistant to the sales manager of The Thew Shovel Co., Lorain, O., died suddenly Oct. 23, in Cleveland, O. Mr. McLain was a native of Greenville, Tex., and had been a member of The Thew Sales Department for the past 10 years.

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Traffic News Digest

LEGISLATION

Transportation Association—The Transportation Association Of America is conducting a nation-wide inquiry to obtain the point of view of as many citizens as possible in determining what really is the "public interest." Thousands of questionnaires containing the inquiry listed below have been mailed to thousands of members and non-members of the Association. To anyone who has not received one of these questionnaires the Association requests that you simply write a letter answering the questions listed below so that they may have your assistance in discovering a sane way out of the present dilemma, preserving private enterprise in this major industry. Letters should be addressed to The Transportation Assn. of America, 400 West Madison St., Chicago, Ill. Here are the questions:

1. Do you believe, if Congress empowers a Government agency to control the supply of transportation and to determine the reasonableness of rates, that it should likewise be charged with the responsibility for maintaining the credit of transportation agencies, viewed as a whole, or by natural groupings?

2. Giving due consideration to the influence of competition which exists among the different modes of transport, is the power of suspension over rates now necessary in the public or carrier interest?

3. Should government authority include the power of fixing both maximum and minimum rates?

4. Should the principles applying to railroad rate-making also apply to other forms of transport?

5. If the policy of permitting transportation a fair return is to be established by law, should it be accompanied by a mandate requiring consolidations within a reasonable period and/or coördination of services among carriers of the same class and between the different types of transport?

6. Anticipating that any policy of fair return which is designed to protect the credit of carriers, as a whole, or by specific groups, may result in indefensibly high earnings by strong agencies while producing low returns for others, should some form of recapture be provided by law so that all or part of unusually high earnings of more fortunate agencies may be taken from them and pooled for the benefit of transportation, as a whole, or by specific groups?

(a) If recapture is provided for, how would you suggest that such funds be used in order to benefit transportation in the country as a whole and in the general public interest?

7. If a more definite policy of fair return for transportation is advisable and the authorized Federal body establishes a rate base and the factors constituting a fair return, for how long a period should the findings be held effective before revision? Should such a period contemplate the average earnings over a period of years of fluctuating business activity?

Chamber of Commerce Conference—A second meeting of the transportation conference of the United States has been called to propose measures to restore railroad prosperity and credit so as to insure continued and improved service under private ownership and operation in the public interest and for the national defense. Since President Roosevelt has promised that a definite railroad program will be considered by the next congress it is probable that all the questions to be considered at this conference will find their way into proposed legislation when congress again convenes. Questions to be considered at this conference are divided into five groups as follows:

Rate Provisions

1. Should a rule of rate-making be adopted similar to that in 1920 act requiring the Interstate Commerce Commission to permit as nearly as may be fair return on the value of the property: or should there be other changes in the rule?

2. Should the Interstate Commerce Commission be empowered, in any proceeding of a general character, whether involving all rates or rates on a particular commodity, to make findings as to what should be the basis of intrastate rates so as to avoid discrimination against interstate commerce and so that the intrastate rates may go into effect contemporaneously with changes in interstate rates?

3. Should the Commission be empowered to suspend a reduction in intrastate rates where there is a prima facie showing that such a reduction would unlawfully discriminate against interstate commerce?

Relief from Burdens and Restrictions

1. Should the land-grant statutes be repealed?

2. Should railroads be relieved of expense in excess of direct benefits to them for elimination of railroad grade crossings and reconstruction of railroad bridges in connection with navigation or flood control projects?

3. Should carriers be relieved of the undistributed profits tax?

4. Should Congress require the government to dispose of the Federal barge lines to private parties?

5. Should restrictive measures such as train-length limit, excess-crew laws, six-hour days, etc., be avoided?

6. Should the railway-labor act be amended—

(a) To include public members in odd numbers on adjustment boards so as to insure disposition of each case in the first instance?

(b) To authorize Federal-court review of adjustment board decisions at the instance of the railroads as now allowed employees?

(c) To place a limit upon the time within which claims can be presented?

Consolidations and Abandonments

1. To facilitate coördinations (and also consolidation), should the railroads be relieved of the burden of dismissal and displacement allowances under the "Washington agreement" between railroads and employees by crediting same against payments due as railroad unemployment insurance taxes?

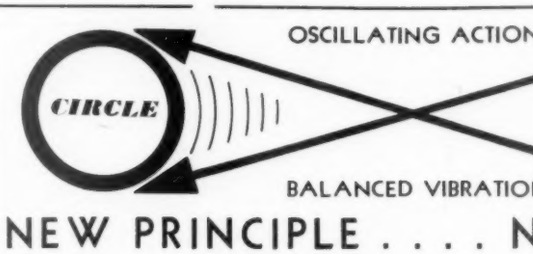
2. To facilitate voluntary consolidation should there be legislation repealing present requirements as to comprehensive plan, balanced systems, maintenance of all possible competition and preservation of existing trade channels?

3. Should there be provision for complete or regional consolidation?

4. Should power of eminent domain be given over minority stock interests and lines desired in consolidations approved by Interstate Commerce Commission?

5. Should the power of Reconstruction Finance Corporation be clarified to cover purchase of new securities of reorganized or consolidated property in order to furnish essential cash to revamp physical plant and to purchase, if desirable, minority interests?

6. Should a Federal authority of three members be established for a period not to exceed five years to develop and to promulgate plans



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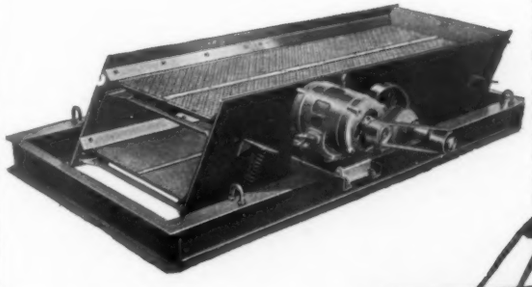

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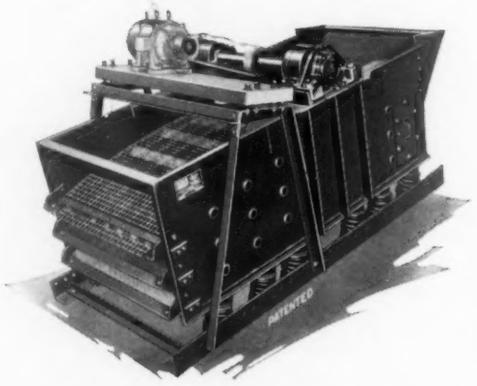
In February, 1938, Field Brothers, general contractors of Lubbock, Texas, wrote us as follows:

"In 1932 we purchased from you one four foot by twelve foot Plat-O Vibrating Screen, Type 1-4-12, single deck. This screen has been one of the most satisfactory pieces of equipment which we have ever used."

In November, 1938, Memphis Stone and Gravel Company, Memphis, Tennessee, which has been purchasing Plat-O Screens since 1932, advised us as follows:

"If you ever need a recommendation for your screen on a job using a very sticky clay gravel type material, which we have found is a great deal more difficult to screen, we would be very glad to furnish it.

"We are very glad to give you such a favorable report for in our mind there is no question of the vast superiority of your screen handling our type of material."



WRITE FOR BULLETIN No. 26

DEISTER MACHINE COMPANY

1933 E. WAYNE ST. FORT WAYNE, IND.

for the coördination and consolidation of the railroads?

(a) Should the Interstate Commerce Commission have powers of compulsion as to coördinations and consolidations proposed by the Authority, or

(b) Should the Authority itself have power to compel coödination and consolidations, or

(c) Should the Authority have power to recommend to Congress legislation necessary for purposes of compulsion, if the Authority, after investigation, shall determine that such legislation is necessary?

7. Should legislation be adopted requiring more expeditious disposition or abandonment applications?

FINANCIAL REORGANIZATION OF RAILROADS

1. To facilitate reorganizations should there be legislation which would permit a carrier and its creditors and security holders to secure approval by the Interstate Commerce Commission of a plan of reorganization which, when so approved, may be made effective against minority interests without delay by a bankruptcy court and without the appointment of a trustee?

FEDERAL FINANCIAL AID

1. Should government loans to railroads be authorized on the basis of the 1920 act on earning prospect of the applicant and without requiring certificate that applicant is not in need of financial reorganization?

2. Should government loans be authorized for new equipment purchases by railroads?

3. Should the Reconstruction Finance Corp. be empowered to purchase obligations of railroads from outstanding holders, either at market prices or at prices to be fixed by Reconstruction Finance Corp. without certificate from Interstate Commerce Commission?

4. Should the Reconstruction Finance Corp. be empowered to furnish equity money or junior security money in proper situations, especially in the case of railroads coming out of reorganization or railroads being consolidated?

EXAMINER'S REPORT

Ground Limestone—Examiner Charles M. Bardwell, in a number of cases involving chalk whiting and ground or pulverized limestone recommends that these commodities be placed on the same basis. The original complaint, to which a number of others were joined, alleged that the rates charged on ground or pulverized imported chalk from Camden, N. J., to destinations in official and southern territory, were unreasonable, unjustly discriminatory, were unduly prejudicial to complainant, and unduly preferential of its competitors shipping ground limestone in the same territories. Commodities considered as chalk whiting, limestone whiting, or whiting substitute are ground or pulverized to such fineness that 98 per cent. will pass through a 200-mesh screen. The examiner recommends that the commission find the interstate rates on chalk whiting from Camden, N. J., to destinations in official territory not unreasonable in the past but unreasonable for the future to the extent they may exceed 20 per cent. of the concurrent first class rates, c. l. minimum 50,000 lb.; that any undue prejudice that may have existed will be removed by the rates recommended; that no violations of the fourth section have been shown and that reparation be denied. He further recommends that former findings in other cases involving rates on ground or pulverized limestone be modified to permit the publication of 20 per cent. of the concurrent first class rates between other points in official territory. A further recommendation was that the intrastate rates on this commodity in New Jersey be found in violation of Section 13 and that New Jersey intrastate rates be brought up to the recommended interstate level. In regard to the rates to destinations in southern territory the examiner said that they had not been shown to be unreason-

(*Continued on page 64*)

Foreign Developments

Clinker Studies With Polarizing Microscope

This study had three successive parts, of which the first was a description of the methods of quantitative determination of clinker minerals in cement with the polarizing microscope, by means of the Leitz integration table or the Fuess "Sigma" integrating device. With a great enough length (in general, 50 to 70 mm.) the results so obtained showed a limit of error of ± 2 per cent. in favorable specimens, and ± 5 to 6 per cent. in unfavorable ones. It is good to distribute the lines of measurement uniformly over the entire section, since dicalcium silicate generally is arranged in nests and not uniformly in the clinker particle; furthermore, the pores are not uniformly distributed and are of quite different shapes.

Microphotographs of the cement-clinker specimens were prepared to complement the investigations, and illumination with monochromatic light (sodium light) was found to be favorable for exposure. Under the conditions that prevailed the most suitable plate was the Agfa Spectral plate, yellowish red and hard.

In the second part of the work the methods of the first part were applied to some experimental burnings. The material was a clinker high in tricalcium silicate, which varied noticeably in quantitative composition in the individual tests. The microscopically determined volume of pores shows a dependence on the liter weight, a high volume of pores corresponding to a low liter weight.

The individual particle fractions from a sharply and a less sharply burned clinker were then investigated. In both clinkers the volume of pores and the content of tricalcium silicate increased with increasing particle size. The absolute values of the volume of pores lie lower in the sharply burned clinker, while the tricalcium silicate content is greater here.

In the third part the formulas of Bogue and Lea for the calculation of the mineral composition from the chemical analysis were discussed and the calculation or conversion factors brought together. Then the values calculated from the chemical analysis for the individual minerals were compared with those of the optical determination. There was no good correspondence. In general, particularly in the case of the sharply burned specimens, the values for tricalcium silicate lie higher in the case of optical determination than those calculated. No explanation could be given for this fact, which had been observed before. In spite of this the optical method offers the advantage, for the determination of the clinker minerals, of giving relatively rapid and reliable indications of the quantitative mineral structure, particle size and particle distribution of the clinker minerals, along with the liter weight and particle composition.—O. E. Radczewski and H. E. Schwiete in *Zement* 27: 246-357, 275-280, 287-291, April 28, May 5 and 12, 1938.

Studies on Import of Bending Strength

While engineers used to evaluate cement on the basis of compressive and tensile strengths, increasing attention has been paid to the bending strength, which originally was taken into account only for road construction. The 4×4×16 cm. test pieces commonly used in Germany were originated by the well-known French investigator R. Feret. The studies reported here were undertaken to determine (1) whether and to what extent the results of bending strength tests depend on the size of the test pieces, and (2) whether and to what extent clear relations exist between the bending and compressive strengths of the 4×4×16 cm. test pieces in Haegerman's method or larger pieces of 7×7×42 cm. of the same manner of production and concrete beams of the usual size (15×10×70 cm.) and manner of production or smaller concrete beams (7×7×42 cm.).

In one series of tests it was determined that the bending strengths and the compressive strengths of the remainders of test pieces in Haegerman's method, of exactly the same method of production and the same age, are dependent on the size of the pieces. The degree of this dependence varies with the brand.

Another series of tests showed, by its results, that the bending strength values of the "standard" pieces can not be directly referred to the corresponding concrete pieces. Each cement behaves differently. The same is true of the compressive strengths of the remainders of the pieces.

From these results it may be concluded that the 4×4×16 cm. test piece is unsuitable, either for the evaluation of the bending strength of a cement or for the determination of compressive strength by means of the test piece remainders. The results with the small pieces under no circumstances yielded a fully valid indication of the strengths to be expected in the concrete, that is, in actual practice.

The results were less favorable than those in the comparative tests published in *Zement*, No. 8, 1938, by Prof. Gehler and Dr.-Ing. Frank of Prague, from which, nevertheless, conclusions as to the concrete strengths could be drawn from the standard pieces.

In view of such contradictions it appears imperative for more investigators to concern themselves with similar tests. It would be desirable to come closer, in the testing methods, to the conditions of practice, instead of getting farther away.—Dr. H. Passow in *Tonindustrie-Zeitung* 62:790-794, Sept. 12, 1938.

Large Chamber Blast Set Off in Germany

The largest chamber blast yet set off in Germany occurred in July, 1938, at the Taschenhof crushed-stone works at Goldberg, Silesia, using 13,350 kg. of donarite and bringing down 270,000 tons of stone for a year's work. The preliminary work required six weeks of day and night work preparing the chambers and the adits in the rock and the careful calculation of the blasting tunnels. Three entries were excavated into the rock to a depth of 40 meters, and at the end of them the blasting chambers were dug. The largest chamber had a volume of 9 cu.m. Thousands of people were alarmed by the report of the big blast, and troops and workmen surrounded the entire area with a chain to hold them back.—*Steinindustrie und Steinstrassenbau* 33:443, October 13, 1938.

Evaluation of Form of Crushed Stone

Practical experience has shown that in crushed stone for concrete and bituminous work the best shape of the particles is cubical. Various theoretical test methods for evaluating the particle form of crushed stone have been proposed. The one described here was developed from practice in the stone-testing bureau of the German state railways, and depends on a count of the particles in a given unit of weight (instead of the unit of volume used in earlier methods). It is shown that the number of pieces in a determined unit of weight gives a comparative indication of the particle shape; the most favorable shape of particle occurs with the smallest number of particles, and *vice versa*. A numerical indication for this evaluation is suggested.—W. Pickel and G. Rothfuchs in *Steinbruch und Sandgrube* 37:235-239, September 20, 1938.

Occupational Diseases and the Law

Dust Injury

Maty v. Grasselli Chemical Co., decided by the United States Circuit Court of Appeals, Third Circuit (New Jersey case), September 2, 1938 (reported at 98 Fed. (2d), 877. This case arose in New Jersey and was decided under the laws of that state.

The plaintiff (employee) worked for almost four years in the silicate department of the defendant's plant and for about a year in the phosphate department. In the latter part of 1931 he developed a cough accompanied by other distressing symptoms which grew progressively worse. In November, 1933 (which also is the last date of the employment) his condition was diagnosed as an abscess on his lung.

Maty brought suit to recover damages for his injury on the ground that his condition was caused by the inhalation of soda-ash dust and other harmful substances while working for the defendant and that the defendant was negligent in failing to warn him of the dangers of this dust, in failing to provide proper ventilating facilities or to take any other measures for his safety and protection.

According to the court's statement, Maty worked approximately four years in the furnace room of the silicate department where silicate glass was manufactured. In the process of manufacture soda ash and sand were mixed in the room adjoining the furnace room, with which it was connected by doors in a wall of corrugated sheet iron. The mixture was conveyed to hoppers from which it was allowed to flow into the furnaces. Maty controlled the speed of the flow of the mixture from the hoppers into the furnaces, and also tended the fires. The air in the furnace room was almost always filled with dust of soda ash and sand. The testimony of Maty showed that the chutes above the furnaces had holes in them; that when the mixture stopped flowing, he had to hit the chutes to start it flowing again, and that when he did this, the mixture fell "like water" in great quantities through the holes, causing huge clouds of dust; that additional dust came into the furnace room through the doors connecting it with the mixing room; that after the employer began manufacturing metasilicate in 1931 in an adjoining room, additional dust found its way into the furnace room from that source; that, as a result, the air in the furnace room was always laden with soda ash and other dust; and that the temperature in the furnace room was quite high, which caused him to perspire freely both in summer and in winter.

In 1932 Maty was transferred to the phosphate department, where he was put to work as a "silico-fluoride operator". Maty testified that soda ash was mixed in a large tank with some liquid to make "soda-ash liquor"; that the soda ash was introduced into the tank from chutes and hoppers which had holes in them through which soda-ash dust would fall; that barium rock and also phosphate rock were ground to powder in the department and that dust arose from this process also. As a result of these operations it appears that the dust conditions in the phosphate department were just about the same as they were in the silicate department.

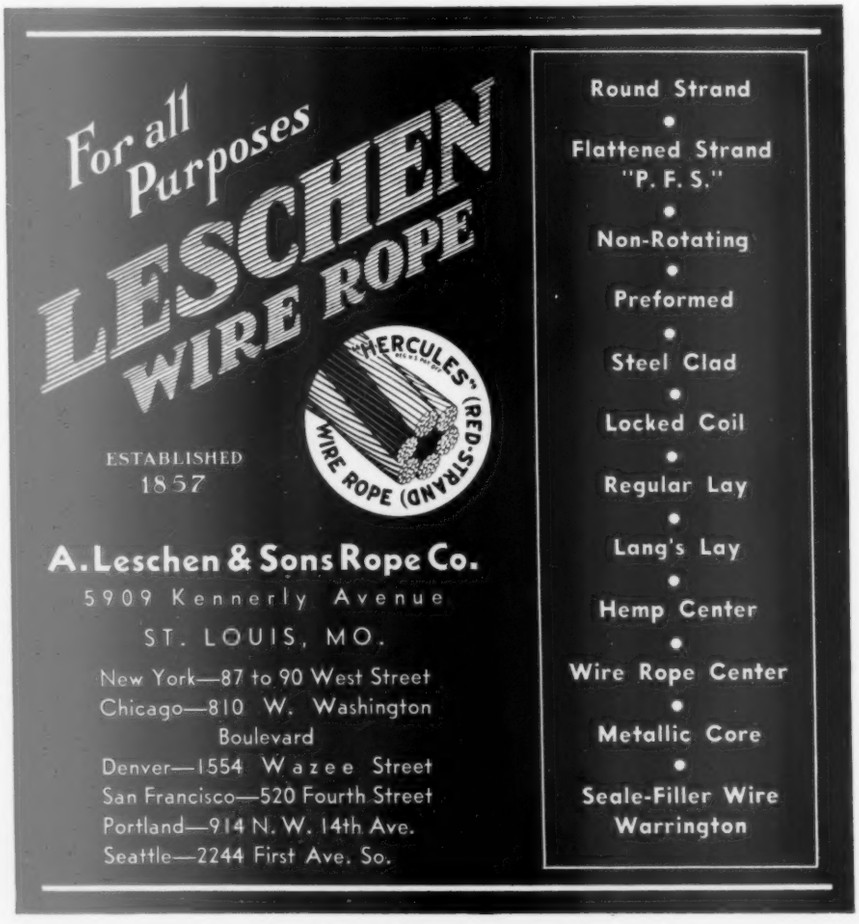
During 1931 Maty developed a severe skin irritation. About that time he developed a cough accompanied by fever, cold sweats, shortness of breath, lack of sleep, loss of appetite and loss of weight. The cough and other symptoms grew progressively worse until in November, 1933, when his condition was diagnosed as an abscess on his lung. In that month he stopped working, and at the time of trial he was confined to his bed. (He died pending the appeal of the suit.)

The court points out that there was no doubt of the seriousness of the disease which the employee contracted after working for several years in the defendant's plant. The testimony of various expert witnesses indicated that the dust conditions were the proximate cause of Maty's illness.

The defendant company denied that it was negligent, but the evidence in the court's opinion was sufficient to sustain the jury's verdict for the plaintiff. The defendant did not provide any ventilating facilities, but depended solely upon the force of gravity and open windows to clear the air, which expert testimony indicates were inadequate. Neither did it provide the employee or other employees with respirators as do some other industries where soda ash is used. "It can not, therefore, be held as a matter of law that the defendant complied with the safety standards prevalent in the industry at that time."

"While the evidence as to the availability of information concerning the danger of soda ash and other dusts may be conflicting, yet there is sufficient evidence of its availability to support the original verdict for the plaintiff.

"The evidence shows that the defend-



ant could easily have ascertained the presence of this harmful dust in its plant and the danger to those working in it. . . . But if it be true that the defendant did not know of the presence and danger of the dust in its plant, it is charged in law with that knowledge and is liable for the damage caused to its employees. 39 C. J., 491; *Smith v. Oxford Iron Co.,* 42 N. J. L., 467, 36 Am. Rep., 535; *Zellers v. Delaney,* 80 N. J. L., 452, 78 Atl., 212. It is immaterial under the facts in this case that it did not foresee the particular injury here involved. 39 C. J., 290."

Negligence

Boal v. Electric Storage Battery Co., decided August 25, 1938, by the United States Circuit Court of Appeals, Third Circuit (Pennsylvania case), reported at 98 Fed. (2d), 815. At the time this suit arose the Pennsylvania Workmen's Compensation Act did not provide compensation for occupational diseases (*Mauchline v. State Insurance Fund,* 279 Pa., 524, 124 Atl., 168; *Plazak v. Allegheny Steel Co.,* 324 Pa., 422, 188 Atl., 130; *Billo v. Allegheny Steel Co.,* 328 Pa., 97, 195 Atl., 110; *Kane v. Federal Match Corp.,* 5 Fed. Supp., 507).* The plaintiff (employee) sued to recover damages for injury from cancer under the tongue alleged to have been caused by the inhalation of a sulphuric-acid mist or spray in the pickling rooms in which he worked; it is alleged that the defendant (employer) was negligent: (1) in failing to warn the employee of the danger, (2) in failing to provide ventilating facilities, or (3) in failing to take any other precautionary measures for the employee's safety.

The court holds that the evidence presented as to the mist of sulphuric-acid as the proximate cause of the cancer was "within the standard of proof required under Pennsylvania law"; that the precautions taken by the defendant for the safety of its employees while working in its plant did not come up to the "standards prevailing in the industry generally"; and that whether or not defendant was actually aware of the danger, it was "charged with the knowledge of . . . the nature of the constituents and general characteristics of the substances used in his business, so that he can give directions for the conduct thereof with ordinary safety to his servants performing the work with ordinary care" (with citations).

Since the plaintiff was not entitled to recover compensation under the Workmen's Compensation Act (the remedy under which is exclusive, 77 Purdon's Pennsylvania Statutes, Sec. 481), he might maintain this suit in tort as his common-law remedy (*Billo v. Allegheny Steel Co.,* 328 Pa., 97, 195 Atl., 110, 114).

Occupational diseases, under decisions of the Pennsylvania courts, have been construed more broadly than diseases known "by common experience" to have resulted from a certain occupation. However, in deciding whether or not injury from a disease was compensable under the Workmen's Compensation Act, the distinction has not been between "occupational disease" and other diseases of gradual development, but between diseases of gradual development and those caused or aggravated by some accident, the former not being compensable under the Workmen's Compensation Act. "An employee does not assume 'the risk of an occupational disease to such an extent that he can not resort to his common-law remedy to secure compensation, provided the disease, whether occupational or otherwise, arose from negligence on the part of the employer.' "

In the present case the evidence showed that the disease did not result from an accident but from exposure to sulphuric-acid mist over a long period of time; the employee therefore was not precluded by the Workmen's Compensation Act from maintaining this action on his common-law remedy in tort.

Silicosis

Golden v. Lerch Bros., Inc., et al., decided by the Supreme Court of Minnesota, after reargument, July 8, 1938; reported at 281 N. W. 249. The plaintiff in this case was employed from 1917 to 1929 as a chemist in defendant's chemical laboratories for testing iron ore. The ore samples, especially "drill samples," contained large percentages of silica, and the laboratory was adjacent to a crusher house where samples were pulverized to minute particles; according to some of the testimony, the dust was "thick, hanging in the air all the time." From the time the plaintiff left this kind of employment in January, 1930, until the spring of 1933 he was not engaged in any kind of work where the breathing of dust entered into his daily life. At that time he became sick with influenza; before fully recovering he caught a bad cold, and in the following summer it was definitely found by his medical advisers that he was suffering from pneu-

* Act No. 552, Laws of 1937, now provides for compensation under the Workmen's Compensation Act for specified occupational diseases.

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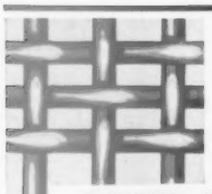

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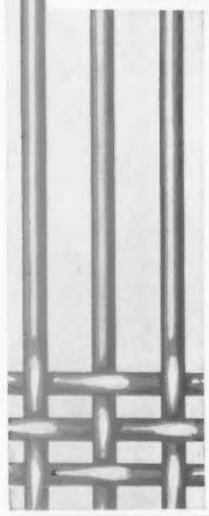

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moconiosis or silicosis with "superimposed tuberculosis."

Suit was brought against the employers to recover damages for an alleged breach of duty on their part in failing to provide and maintain proper and efficient ventilation for removing the dust, failing to comply with the requirements imposed by Sec. 4174, Mason's Minnesota Statutes of 1927. In the district court judgment was rendered for the defendants, but that judgment is reversed by the Supreme Court.

The Supreme Court holds that "silicosis has been recognized as an occupational disease and is covered by the compensation acts of several states. It has not been included in ours. . . . It is our plain duty to recognize and apply the usual standards applicable to ordinary negligence cases. The statute has fixed the standard of conduct. It was violated, and harm to plaintiff resulted."

The court further holds that medical expert testimony was an appropriate means to employ to provide the connection between plaintiff's employment and the resulting condition; and that assuming that contributory negligence was a permissible defense (*Suess v. Arrowhead Steel Products Co.,* 180 Minn. 21, 230 N. W. 125), that issue was submitted to the jury and decided adversely to the employers. The statute of limitations (six years) was invoked on the contention that all injuries antedating by more than six years the commencement of the suit should be barred; the court holds, however, that the statute of limitations is an affirmative defense with the burden of proof upon the defendant, and that since the claim of the defendants was that there could be no recovery at all, that defense must fall.

Allegations of Fraud

Allen v. Caterpillar Tractor Co., decided by the U.S. Circuit Court of Appeals, 7th Circuit (Illinois), April 19, 1938. This case, in which the employee sought to obtain damages for inhalation of dust containing silica against which the employer failed to protect him, was based in part on the company's alleged negligence, and in part on allegations of fraud. As to the allegation of negligence, since the case arose before the present Illinois Occupational Disease Act, the suit and this appeal were dismissed on account of earlier decisions that in Illinois there is no common law right of action to recover for an occupational disease.

The Court holds that while a cause of action may be based upon deceit and fraud, the allegations of fraud and deceitful practices must be specifically set forth, and the allegations in the present case were not sufficiently specific to make out a case of fraud.

Traffic *(from page 60)*

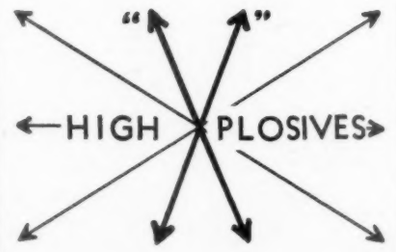
able or otherwise unlawful. I.C.C. Docket No. 27,921, Southwark Mfg. Co. *v.* Pennsylvania *et al.*, and cases joined therewith. (A complete list of other cases will be furnished upon request).

Sand—Examiner Lewis L. Prout recommends an award of reparation of $114.14 with interest on a finding that the rate charged of $3.90 a net ton on two cars of foundry sand from Humaston, N. Y., to Hills Grove, R. I., shipped between July 1, 1935 and August 30, 1936, was unreasonable to the extent it exceeded $2.90. I.C.C. Docket No. 28,025, Rhode Island Malleable Iron Works *v.* N.Y.C. *et al.*

NEW COMPLAINTS FILED

Lime — A cease-and-desist order and new rates are requested on an allegation of unreasonable rates on fluxing lime from Lawrence, O., to destinations in Kentucky, Ohio, Pennsylvania, and West Virginia in a complaint filed by C. N. Thompson, 312 Kitchen Bldg., Ashland, Ky., in I.C.C. Docket No. 28,131, Ohio Calcium Co., Inc., Lawrence, O. *v.* B. & O. *et al.*

Sand—Alleging unreasonable rates on sand from Schuyler Junction, N. Y. and Selkirk, N. Y., to Winchendon, Mass., reparation is sought in a complaint filed by Abner Pollack, 1148 Manor Ave., New York, N. Y. in I.C.C. Docket No. 28,135, Alaska Freezer Co., Inc., Winchendon, Mass. *v.* B. & M.



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The principle used is the varying ratio of air resistance to momentum of different sized particles traveling at equal velocities. To illustrate this principle, assume two cubes of a certain material, one having dimensions twice as large as the other. The larger cube will weigh eight times as much as the smaller one, but the area of one face of the larger cube will be only four times as large as a face of the smaller one. If both cubes are moving through air at equal velocities the larger cube will have eight times the momentum of the smaller one, but since the retarding effect of air resistance is proportional to area and therefore only four times as great, the momentum of the larger cube will not be overcome as quickly and it will consequently travel farther before coming to rest.

In order to apply this principle it is necessary that (1) *all* particles should be given exactly the same initial speed and direction, (2) the air should be substantially at rest, and (3) the particles should be separated from each other so as to allow each one to act independently. The mechanical device which meets these conditions is shown in Fig. 1.

The essential elements of the machine are a drum having a shallow groove in its rim, three idler pulleys, an endless belt wrapping around the drum and pulleys, and a chute for feeding material into the space between the belt and drum. It will be seen that the material travels through an arc of about 225 deg. and is then discharged. In traveling its circular path through the machine the material is pressed against the belt by centrifugal force, which causes it to pick up speed rapidly. Thus a discharge velocity of over 4,000 ft. per min. is obtainable and velocities in the neighborhood of 3,000 ft. per min. are actually employed. If the belt is given a speed of 3,000 ft. per min., the material will acquire this speed and come to rest on the belt at some point preceding the point of discharge and this will insure having every particle projected in exactly the same direction and at the same velocity as every other particle.

To fulfill condition (2) of having the air substantially at rest, the only requirement is that the room containing the apparatus shall have no open doors or windows. Condition (3) of giving each particle room to act independently is obtained by limiting the rate of feed. It is evident from this that there will be an inverse relation between capacity and efficiency, much the same as there is with ordinary screening apparatus. If the rate is such that the projected stream has a thickness about equivalent to ¼ the diameter of the average particle, the resulting classification will be very exact. However, with a thickness of stream several times this amount, the quality of classification is still high enough for many practical purposes.

Although the projected stream must be kept thin, the capacity of the device is nevertheless

View showing how the new classifier operates.

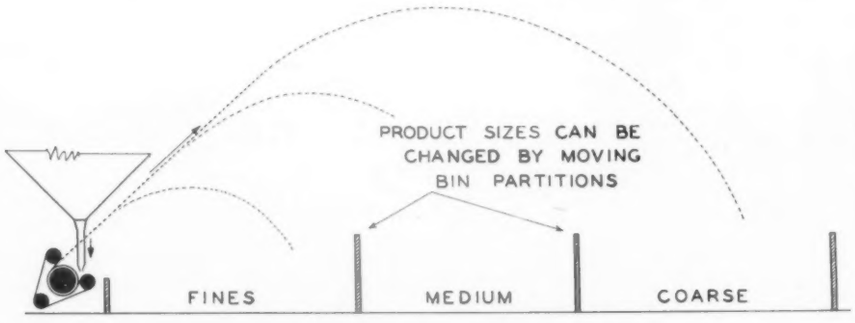
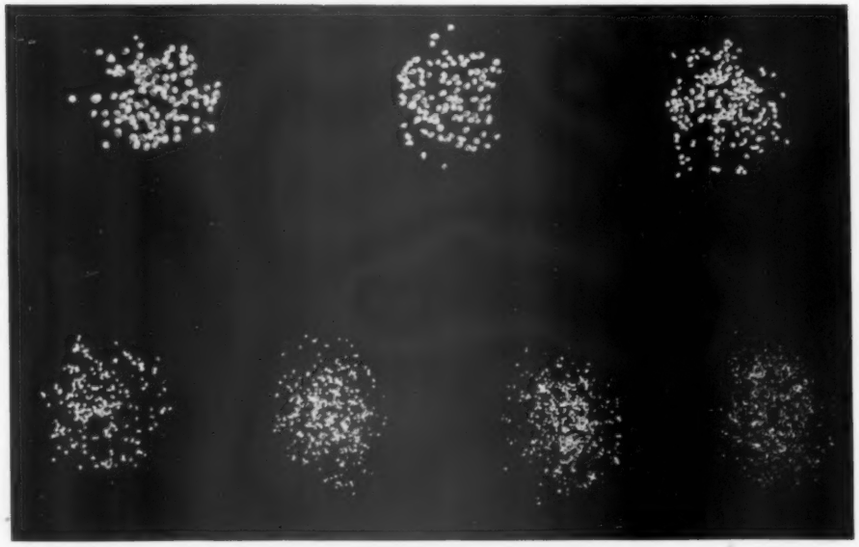


Diagram showing how the sizes are determined.



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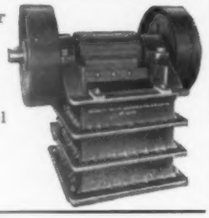

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NAYLOR LOCKSEAM SPIRALWELD **PIPE**

..The Pipe with the Built-in **SAFETY** *that absorbs shock loads — protects your lines .. another reason to specify Naylor!*

Sizes from 4" to 30" in diameter with all types of fittings and connections. Complete fabrication service. Quotations on your requirements furnished promptly.

WRITE FOR CATALOG No. 37

NAYLOR PIPE COMPANY
1237 EAST 92nd STREET
CHICAGO, ILLINOIS

The Warren limestone conveyor and spreader is made to fit any truck or trailer. The hopper will hold six tons, has a screw-conveyor underneath with a power take-off from the transmission on the truck. This screw-conveyor carries the limestone evenly back to the spreader. It is being marketed by H. L. Warren, Kinmundy, Ill.

large, due to the high velocity of discharge. For instance, a stream of 100-lb. material having a width of one foot and a thickness of 1/100 of an inch, if projected at 3,000 ft. per min. would amount to more than 7 tons per hour.

A typical example of classification is shown in the larger illustration. The grains of silica sand were taken at intervals of 3 feet from the point of discharge of the classifier, the largest grains having been projected a distance of 21 feet.

The chief advantages of the Aurora Classifier over common types of screening machinery are:

1. Absence of wire cloth and therefore of all cloth troubles such as blinding, breaking, tearing, and wearing out.
2. Production of as many sizes as desired in one operation.
3. Ease of adjusting division points between various sizes of grains.

• Crusher

The Kue-Ken "balanced" crusher is a modern development by the Straub Mfg. Co., 528 Chestnut St., Oakland, Cal. The crusher is modern in its smooth streamlined all-steel dustproof housing, and has an oil-bathed, dynamically-balanced simple mechanism.

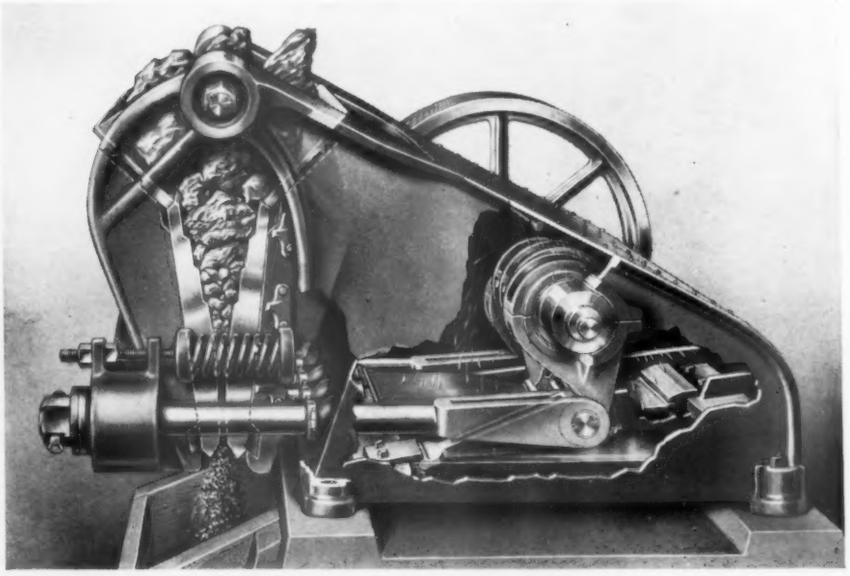
It does primary and secondary crushing at a single pass, eliminates other machinery, bins, etc. Its new crushing principle of opposed, balanced, pendulum jaws eliminates abrasion and vibration, the things that often hurry crushers to the scrap pile. Power is saved because its mechanism and pendulum jaws convert 95 per cent. of the power input into useful work.

It is protected against tramp iron by a reliable overload release.

Compact, it requires less headroom and floor space.

The accompanying cut-away view shows the crusher's numerous mechanical features in a graphic manner.

In 1939, Cummins Engine Co., Columbus, Indiana, prominent builder of automotive, industrial and marine Diesel engines, is expecting to double this year's sales volume which will be considerably in excess of their record set in 1937. The needed expansion of production facilities and places for more men is now being provided by a new building under construction by the Austin Co. Equipped with the finest and most accurate machinery possible to obtain, it is said that the completed project will represent an expenditure of approximately $400,000. It will be used exclusively for the finish and assembly of Cummins diesel fuel injectors and the assembly of diesel fuel pumps.



Both jaws swing in this new crusher.

• Diesel Engine

For the past 8 years Mack Trucks, Inc., New York, N. Y., has carefully observed developments in the Diesel field. Hundreds of Mack trucks have been equipped with the leading American and European Diesel engines. Lessons learned in testing and servicing these engines in every type of service throughout the world directed the development and determined the final design of Mack's own Diesel engine now in production.

At present the Mack-Lanova Diesel engine is available in one size. Of the 6-cyl. type with 4⅜-in. x 5¾-in. bore and stroke, it has

The new Diesel truck engine.

a 519-cu.in. piston displacement and develops 131 hp. at 2,000 r.p.m. Of the conventional 6-cyl. form, this engine operates on the four-stroke cycle. Bosch injection equipment is used, and the starter operates on 24 volts. As its name implies, this new engine employs the Lanova energy-cell combustion system.

As in all Mack engines, particular emphasis has been placed upon temperature control and especially on this engine in view of the importance of temperature control on Diesels. Thermostatic control of flow is utilized on a distinctive Mack cooled-circulation principle to maintain water temperature within the efficient operating range, the elements of this system being the thermostatic valves and the cold water bypass. Besides cooling the cylinders and heads the cooling system is also effective in maintaining oil temperature, effecting a quick warming of the oil as well as cooling it when operating under heavy duty.

Oil filtration is provided by a filter built on the engine. The filter element is of the cut-back type and the return oil is led down below the crankshaft level instead of being returned direct to the case where it would set up additional spray by the stream being struck by the rotating parts.

The crankcase is ventilated through the tappet chamber and push rod passages to the rocker arm chambers at the top of the engine from where a two-part aluminum header connects with the air filter.

• Bearing Seal

A patented "triple seal" which effectively protects the bearing against lubricant leakage, dust, dirt, and moisture has been made available by SKF Industries, Inc., Philadelphia, Pa.

This seal consists of two split "piston rings" on each side of the housing and grooved on the outside diameter to form a labyrinth seal with the two end bores of the housing. Each ring has an inward tension that enables it to turn with the shaft.

The "triple seal" is made for the complete range of standard shaft sizes, and is designed for split housings which are machined to allow

Bearing showing "piston-ring" seal.

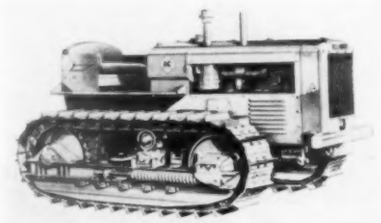
axial freedom of the bearing. These housings are sturdy and designed to accommodate various shaft diameters which are necessary to compensate for the various types of bearings having the same outside diameter.

Another unique advantage is that when a bearing is to be stabilized, the same housing is used as for the floating bearing. The stabilizing is effected by one or two rings depending on the width of the particular bearing used. A segment of the ring is removed so that it can be slipped over the shaft and applied between the outer race of the bearing and the housing shoulder. This avoids the necessity of supplying two different housings and enables the user to stabilize or float any one of the bearings in any application.

• Tractor

A new gasoline tractor, the Model "S," has been announced by Allis-Chalmers Mfg. Co. This new machine is much the same in appearance and performance as the Model "S-O" controlled-ignition oil tractor which has been a leader in the A-C crawler-tractor line for several years.

The Model "S" develops 77.66 hp. on the belt, 64.52 hp. at the drawbar and 16,732 lb. drawbar pull in first gear. The constant mesh transmission provides five forward speeds from



Exceptional fuel economy is claimed for this tractor.

1.52 to 6.37 mi. per hr., and the constant mesh feature makes it possible to shift "on the go" like a truck. The tractor is offered in two tread widths, 62 and 74 in.

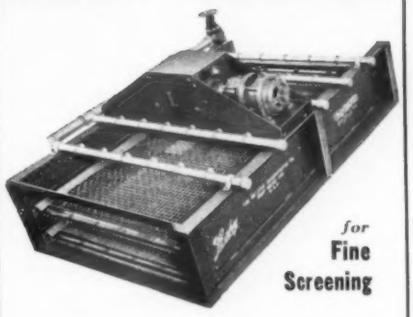
A new 4-cyl. valve-in-head gasoline engine has been developed for the Model "S." Like all other Allis-Chalmers engines it has removable cylinder lining and inserted valve seats. The most remarkable features of this new engine is said to be its exceptional fuel economy.

• Detachable Container

The "load forward" Dempster-Dumpster, now in production by Dempster Bros., Inc., of Knoxville, Tenn., is the newest development in detachable containers for truck hauling.

By an exceedingly simple mechanism, the entire detachable container is carried forward on the truck chassis, thereby allowing larger capacities on smaller trucks. By an exclusive, patented dumping mechanism the contents are quickly discharged by levers operated from the cab by the truck driver. The entire load

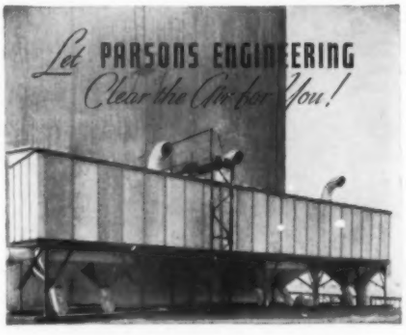
THE NEW
LEAHY SCREEN



for Fine Screening

The new Leahy No-Blind Vibrating Screen is unsurpassed for fine screening. The Leahy vibration principle keeps the entire screen surface working at *top efficiency*, insuring *increased capacity*, with *maintenance costs negligible*. It pays large dividends on your investment. Investigate its advantages and economy.

The Original
DEISTER CONCENTRATOR COMPANY
Incorporated 1906
911 GLASGOW AVE., FT. WAYNE, IND.
104 Pearl St., New York



A 15-year record of repeat business would imply that sound Parsons engineering is worthy of *your* investigation, too. Parsons' patented oval bag principle, long life, low dust count and minimum maintenance enable Parsons Dust Arrestors to excel in the cement industry. Write for our Bulletin DA-6.

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SECO
VIBRATING SCREENS

Patented

A scientifically designed screen with an entirely new principle. Faster and more accurate sizing, obtained by a positive, controlled circular motion. A feature exclusive with Seco.

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BACON
FARREL
CRUSHERS

Complete Plants Designed and Equipped.
Screens, Elevators, Conveyors, Quarry, Sand and Gravel Plant Equipment.
Engineering Service.

EARLE C. BACON, Inc.
17 John Street New York, N. Y.

may be discharged at once or gradually, as desired. Chips may be spread evenly over a wide area, and the detachable container may be carried low to the ground, and be used as a spreader to more evenly distribute the dumped contents. The Dempster-Dumpster "load forward" model may be furnished in sizes ranging from 1 to 6 cu. yd.

• Motor Trucks

A 1939 line of Ford V-8 trucks equipped with hydraulic brakes and comprising the widest selection of capacities, gear reduction ratios and power it has ever offered the transportation field, has been announced by the Ford Motor Co.

With two clutches, five transmissions and eight rear axle ratios, in addition to various wheel and tire sizes which may be chosen, operators may obtain V-8 trucks and commercial cars which are virtually custom-built for their own particular commercial transportation problems. The line is designed to meet the requirements of more than 90 per cent. of all commercial operations.

Cab-over-engine truck.

Hydraulic brakes are engineered to conform with Ford design and practice, insuring quick stops with easy pedal pressure.

Three V-8 engines are available for 1939. Heading the list is the new 95-hp. engine with piston displacement of 239 cu. in.

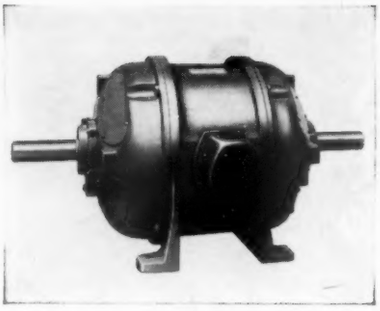
A number of refinements have been made in the 85-hp. engine. The crankshaft is larger and heavier with diameter of main bearings increased to 2.5 in. Another innovation inaugurated by Ford this year is the use of tungsten-steel valve-seat inserts for all valves in both the 85- and 95-hp. engines. Previously valve seat inserts were used only for exhaust valves. New type piston rings in all 1939 Ford V-8 engines provide increased oil economy.

The new rear brakes on the 134- and 157-in. wheelbase and cab-over-engine units have been increased in size from 15⅛ by 2½ in. to 15 by 3½ in. Front brakes are 14 in. by 2 in. The hand-brake system is completely independent.

• Hoist Motor

Type CS hoist motors, designed for severe intermittent service where frequent starts, stops and reversals are encountered, and especially applicable for hoist service and also as door operators, auto lifts, gate valves, blast furnace mud guns, and car spotters are announced by Westinghouse Electric & Mfg. Co.

The high-resistance rotor provides the highest ratio of starting torque to starting current obtainable with a squirrel-cage motor. They cause minimum disturbance to the line and permit the use of a low cost full voltage starter on the majority of installations. They handle light loads quickly while heavier loads cause the speed to decrease with a corresponding increase in torque.



Motor for intermittent service.

Ball or sealed-sleeve bearings can be furnished specially designed both to exclude dirt and foreign particles and to prevent loss of lubricant. They can also be built with special mounting brackets. The frame is cast in one solid piece with feet cast integral providing an exceptionally strong rigid design especially suited to withstand heavy overloads and frequent reversals without distortion.

• Conveyors

The Chain Belt Co., Milwaukee, Wis., has announced the addition of a complete new line of screw conveyors and steel buckets. While the company has always made some screw conveyors and steel buckets, the complete rounding out of the line has been made possible by the acquisition of the machinery and drawings of the Weller Mfg. Co., Chicago. Manufacturing operations will continue in Chicago.

The addition of the complete line of screw conveyors and steel buckets furthers the scope of application of the chain and conveyors made by Chain Belt Co. As a result of additions made from time to time, the company now produces a wide range of conveyors for handling bulk materials, packaged goods and materials in process, the latter typified by assembly conveyors as used in the automotive industry. The company also makes sewage-disposal equipment, sprocket chain, and power-transmission machinery. Its construction line, consisting of various types of

Sand is excavated and hauled from the deposit near Glasgow, Del., to the washing plant in the background by this Allis-Chalmers Model K tractor and 4-cu.yd. Continental scraper, operated by the Wilson Contracting Co.

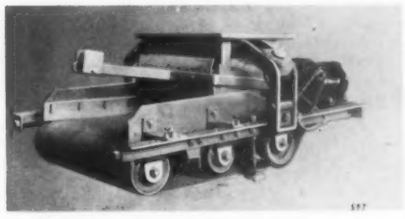
concrete-mixing devices and water pumps, includes the Rex Pumpcrete (the pump that pumps concrete) which revolutionized concrete placement methods.

• Improved Feeder

The Hardinge Co., Inc., York, Pa., has announced an important improvement in its constant weight feeder, which allows the use of 440- and 550-volt motors and gear motors on the feeder frame itself without resorting to separate transformers previously required, because of the flexibility of the connections now employed.

This new connection consists of an unusually flexible, armored casing which meets Underwriter's requirements. The change simplifies the feeder and reduces costs in cases where higher voltage motors are desired.

Other improvements made increase the accuracy of the feeder in handling coarse materials. It is now possible to handle crusher



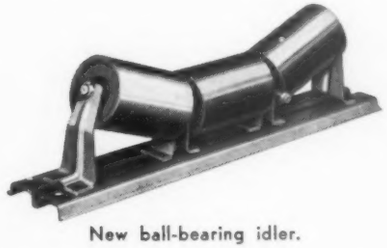
Improved constant-weight feeder.

feed 18 in. in diameter in the "D" feeder, but a more important use is the feeding of finer materials from 2 in. on down to dust. In such instances the "A," "B" and "C" type Feeders are preferable, because of their compactness and lower cost.

• Conveyor Idler

To meet the need for a low-priced troughed anti-friction idler for belt conveyors handling materials of medium weight, consisting of fines and small lumps, the Link-Belt Co. has developed and placed on the market an inexpensive ball-bearing idler, designated as Type 90, for conveyor widths of 14 to 24 in.

The idler rolls are made from 4-in. diameter smooth finished-steel tubing with formed heads pressed into and welded to each end,



New ball-bearing idler.

and fitted with ball-bearings enclosed in a grease-sealed labyrinth.

The rolls are mounted close together in reinforced steel brackets welded to a steel mine-tie base, the ends of which have slotted holes, permitting convenient adjustment on the supporting framework. The roll shafts have slotted ends to provide a positive, locked seat in the roll supporting brackets.

The rolls are rounded and smooth, preventing injury to conveyor belt, and may quickly be removed. As the space between the rolls is very small, creasing of the belt is avoided. Easy handling and erection are afforded by the light all-steel construction of the entire unit.

The return-roll idler, Type 91, is supported by reinforced-steel hangers having slotted openings which serve as seats and anchors for holding the necked roll shaft in place.

A spreader for agricultural limestone, mounted on a truck chassis and driven by take-off from the truck motor is just being placed on the market by J. Roach Sons, Inc., Plainfield, Ia. The box has a capacity of four tons of material and a high degree of uniformity of spread is claimed by the maker.

• Pressure Controller

The Brown Instrument Co. announces the development of the Air-o-Line furnace pressure controller. Long past its pioneering stage, this instrument is applicable for controlling any pressure in the range from —5.0 in. H_2O to +5.0 in. H_2O.

The controller is essentially a sensitive, inverted-bell type draft indicator combined with the well-known Brown Air-o-Line control unit. Automatic reset and fully adjustable throttling range prevents the furnace pressure from lining out at some point other than the control point and eliminates over-correcting and cycling.

This instrument has consistently held furnace pressures within plus or minus .002 in. of water on a scale span of 0.2 in. of water. Not only is it accurate but it is practically instantaneous in operation, as the pointer will move 10 per cent. of the total range in one second, and 100 per cent. of the total range in three seconds.

The controller is adaptable to installation on all types of furnaces, stills, kilns, ovens and other similar equipment where very low differential or static pressure must be maintained.

Controller for furnace and kiln pressures.

PYRASTEEL
for high temperatures
EVANSTEEL
for hard service

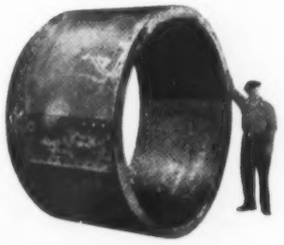
WILL LOWER YOUR COST PER BARREL

Liner plates of latest design in Pyrasteel for the Vanderwerp recuperator

COOLING EQUIPMENT

For all makes of cooling equipment, PYRASTEEL gives unequalled service at temperatures up to 2000°.

Vanderwerp recuperators now using PYRASTEEL liners are giving superior results with reduced costs.



KILN ENDS

Kiln ends made of PYRASTEEL are designed for continuous service at high temperatures, 1950° F and provide the most economical means of saving fuel.

Consult our Cement Mill Department

A practical knowledge of cement mill operating problems often enables us to make recommendations for the use of PYRASTEEL and EVANSTEEL which have resulted in improvements in operating methods, thus cutting the cost per barrel.

CHICAGO STEEL FOUNDRY CO.
Makers of Alloy Steel for Over Twenty-five Years
Kedzie Ave. at 37th St.
CHICAGO, ILLINOIS

Originally introduced as a 1¼-in. pump, this unit, made by Construction Machinery Co., Waterloo, Ia., has recently been enlarged to a 1½-in. size with consequent greater capacity and better performance. Powered by ¾- to 1-h.p. four-cycle air-cooled engine, it is able to deliver up to 5,000 gal. per hr.

• Mixing Plant

The Strayer portable concrete plant is a complete mixing plant which reduces transportation expense to a minimum, avoids delay in starting work and saves costly set-up charges. It can be ready to make concrete in one hour after arrival at job. It produces quality concrete where used at least possible cost and is adaptable to small and large size jobs. Exclusive of cement handling, the plant is operated by one man from platform where all controls are conveniently located. Besides these savings the plant is self-loading by means of vertical elevator with large truck hopper. The elevator is driven by same power unit which drives mixer.

The plant is compact enough to be portable and to conform to regulation highway clearances, yet has mixer, bin and loading capacity for large production, it having a capacity of 32 cu.yd. per hr.

The complete plant, which includes bin, weighing AggreMeter, bag cement hopper, mixer, power unit and material elevator for loading bin, is mounted on steel truck frame with dual pneumatic tires. When the bin is empty the plant can be hauled back of truck from job to job. The elevator is then pivoted to a horizontal position and bin sides are hinged down to make low overall height. The elevator is swiveled to traveling also operating position by winch driven by power unit.

The plant has all the necessary controls to meet the most exacting concrete specifications. It is powered by a 32-hp. gasoline engine and is manufactured by the Erie Steel Const. Co., Erie, Pa.

• Small Precipitator

A miniature Cottrell electrical precipitator designed to make precipitating action visible was shown at the recent metals-mining convention in Los Angeles by Western Precipitation Corp.

The demonstrating precipitator handled only a few cubic feet of gas per minute, but was built on the same principles as are followed in the large commercial installations for the treatment of several hundred thousand cubic feet of gas per minute.

In addition to the small precipitator, Western Precipitation Corp. also exhibited two new orifice-type gas scrubbers.

Truck in unloading position at hopper of the portable concrete-mixing plant.

Trade Literature

Hard-Facing Wearing Surfaces with Haynes Stellite Rod. 6 p. Haynes Stellite Co., Kokomo, Ind.

Rugged, Light Aero-Vibe Screens. 8 p. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Amsco-Alloy Castings for Industrial Applications. 24 p. American Manganese Steel Division, American Brake Shoe & Fdry. Co., Chicago Heights, Ill.

Caterpillar Diesel D4 Tractor. 32 p. Caterpillar Tractor Co., Peoria, Ill.

High-Duty Magnetic Clutches and Combination Clutch-Brakes. 16 p. Stearns Magnetic Mfg. Co., Milwaukee, Wis.

Arc Welding Electrodes & Accessories with Procedure for Welding Various Metals. 36 p. Lincoln Electric Co., Cleveland, O.

Hilco Oil Reclaimer. 16 p. The Hilliard Corp., Elmira, N. Y.

How to Handle It If. . . . 6 p. Chain Belt Co., Milwaukee, Wis.

Bearings, Bushings and Bearing Metals for Industrial Application. 16 p. Federal-Mogul Corp., Detroit, Mich.

Rex Roller Chains and Sprockets. 128 p. Chain Belt Co., Milwaukee, Wis.

Universal Chain Hoists. 4 p. McCollum Hoist & Mfg. Co., Downers Grove, Ill.

American Gasoline, Diesel and Electric Hoists. 16 p. *American Gopher Shovels, Draglines, Clamshell Cranes.* 8 p. *The New American General Purpose Hoist.* 24 p. American Hoist & Derrick Co., St. Paul, Minn.

The Merrick Feedoweight. 12 p. (Bulletin 388) Merrick Scale Co., Passaic, N. J.

INCORPORATIONS

Murphy Silica Products Co., Los Angeles, Cal. Capital stock, $25,000. Incorporators: B. R. Murphy, F. V. Little and G. A. Costello.

Harrison & Gibson Sand Corp., Columbia, S. C. Capital, $10,000. Incorporators: E. W. Gibson and Gaines W. Harrison.

Jersey Sand & Gravel Corp., Vineland, N. J. Capital, 2,500 shares n.p.v. Agent: Phillip L. Lippman.

Valley Ready Mixed Concrete Co., Appleton, Wis. Capital, 500 shares of $100. Incorporators: W. K. Miller, J. N. Garvey, D. E. Coffey and F. Murphy.

Certified Ready Mixed Concrete Co., Inc., Lewiston, Me. Capital 1,000 shares n.p.v. Incorporators: Ludovic Moreau, Anna Moreau and Kenneth H. Cadigan.

North Shore Sand & Gravel Corp., New York, N. Y. (Queens). 1,200 shares n.p.v. Agent: Walter G. McGahan, 141 Broadway.

Self Concrete Brick Co., Martinsville, Va. T. H. Self and T. C. Self.

Fairfield County Sand & Gravel Co., Fairfield, Conn. Capital 1,000 shares n.p.v. Incorporators: Ned E. Ostmark, Frank E. Gartland, Esther Wakeman.

The Alban Tractor Co., Baltimore, Md., has been appointed distributor for Haiss clamshell buckets in Maryland and the District of Columbia.

Write for Your FREE Copy of the

CONCRETE INDUSTRIES YEARBOOK

The first edition of the Concrete Industries Yearbook will appear February 1. The book will cover, in text and illustration, the manufacture and merchandising of concrete units and ready-mixed concrete. While every producer of aggregates will receive the material contained in the Yearbook as part of the 1939 edition of Pit and Quarry Handbook, the Concrete Industries Yearbook is intended solely for distribution among reputable and recognized manufacturers of concrete products and ready-mixed concrete who are not engaged in aggregates production and would, therefore, normally not receive the Handbook.

If you produce ready-mixed concrete, or concrete block, brick, tile, pipe or other precast concrete units and would like a FREE copy of this valuable 84-page textbook, send your request on your business letter-head to the address below at once.

PIT AND QUARRY PUBLICATIONS

538 South Clark Street Chicago, Illinois

By W. E. TRAUFFER

RIGHT—Reading across, Plant No. 1, the Plymouth Road plant and the Seven-Mile Road plant of the Koenig Coal & Supply Co., Detroit, Mich., which now batch concrete materials by scientific control methods.

Detroit Producer Adopts Precision Control of Ready-Mixed Concrete

LONG a leading producer and retailer of sand and gravel in the Detroit area, the Koenig Coal & Supply Co. of Detroit, Mich., now also ranks as one of the most important producers of ready-mixed concrete in that city. The recent adoption at the company's three central-batching plants of the precision control method of concrete manufacture developed by the Scientific Concrete Service Corp. of Washington, D. C., further stamps this company as one of the most progressive producers in this industry.

This system, known as $(SC)^2$, makes possible the use of laboratory-control methods on large-scale commercial production. Its primary purpose is to make possible the production of a concrete of predetermined strength through the accurate control of all its ingredients. The control of the cement-water ratio eliminates excess water and results in important savings of cement by preventing the wastage common under less accurate methods. The total amount of mixing water is held constant within 1 per cent. and this is done semi-automatically, in every batch, without any mathematical computations or the use of charts or diagrams. The moisture determinations and compensations for both the sand and the coarse aggregates for each batch are made in approximately one minute.

One of the mixer trucks being loaded at Plant No. 1.

Precise control of the aggregate grading and the prevention of segregation lessen the volume changes in the concrete, reducing the tendency to crack and disintegrate and insuring maximum density.

The Scientific Concrete Service Corp., through this service, guarantees in writing every batch of concrete. Its concrete technician is constantly on duty at the mixing plant, making the necessary tests and supervising the manufacture of the concrete.

The Koenig Coal & Supply Co. was formed in 1870 by Peter Koenig, father of the president of the company, John F. Koenig. Originally dealing only in coal, the company in 1920 added building supplies to its line and in 1924 went into the production of sand and gravel at Oxford, Mich. In January, 1935, the No. 1 ready-mixed-concrete plant was put in operation at the company's yard at Scott St. and the Grand Trunk Rwy. in Detroit. Plant No. 2 was built in 1936 at Plymouth and Telegraph Roads, and Plant No. 3 went into operation late in 1937 at Seven Mile Road and the Grand Trunk Rwy. These three plants are so located that almost any part of the city or of Wayne County can be reached with a comparatively short haul. The company has a yard on the Rouge River at Fort St. and it is expected that Plant No. 4 will be built there in 1939, giving complete coverage of the entire metropolitan area.

The company started out with 4 truck-mixers and this fleet has been expanded gradually until it now numbers 35. Jaeger truck-mixers are used exclusively and these are mounted on 34 Mack and one Autocar chassis. Twenty-five are 4-cu.yd. and ten are 3-cu.yd. mixers. Deliveries are made up to 20 mi. from these plants, which have produced as much as 1,500 cu.yd. of concrete in one day. The Scott St. plant alone recently produced 771 cu.yd. in a 10-hr. day. These plants are also used for dry-batching aggregates and a total of 3,000 cu.yd. of concrete and aggregates has been batched in a day.

Concrete has been supplied by these plants to many large building and construction projects in or near Detroit. Late in 1937 6,000 cu.yd. was supplied for the new Diesel-engine plant of the General Motors Corp. In the spring of 1938 20,000 cu.yd. was used in the new

½-ton truck plant of the Dodge Bros. Corp. and a 12,000-cu.yd. contract for the new U. S. Veterans' Hospital has just been completed.

The first job for which the Koenig Coal & Supply Co. furnished this "scientific" concrete was the new Parke-Davis & Co. factory and warehouse. The concrete was used in the pouring of 74 concrete piles, each containing 60 cu.yd. of concrete, in caissons 100 ft. deep. A very workable concrete with only a 1-in. slump was secured.

The three plants are almost identical in design and construction and were planned by the Butler Bin Co., which also supplied most of the equipment, including the bins and weighing batchers. In installing the new control system the aggregate and cement batchers were welded together and a water tank was attached. This 3-compartment weighing batcher is now supported on a single framework attached to a Toledo springless dial scale specially designed for this system.

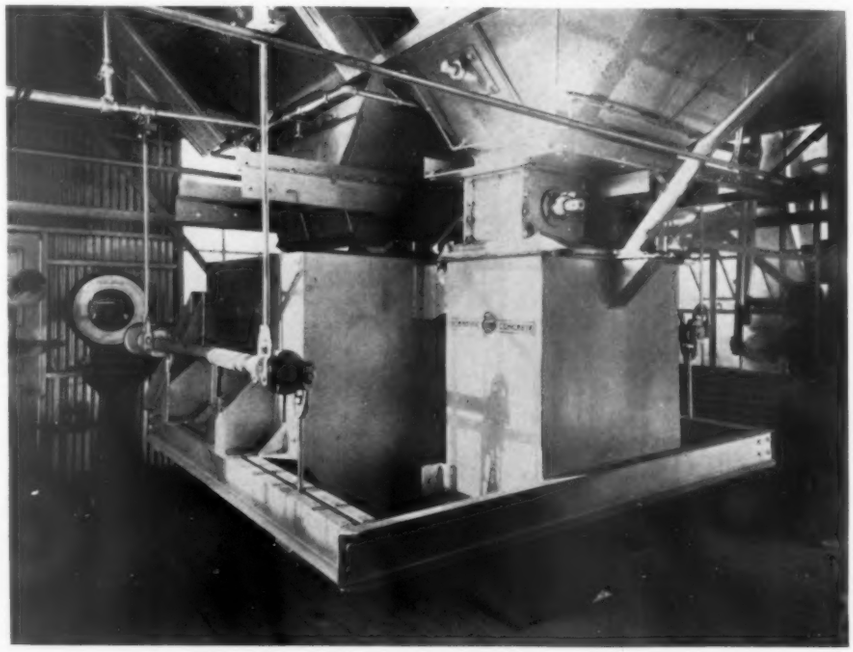
The composite batcher has a maximum capacity of 4½ cu.yd., which is ample as the largest truck-mixers operated by the company are of 4-cu.yd. capacity.

Each plant has a boiler for steam-heating the aggregates in the bins and the mixing water. Concrete construction continues through the winter in Detroit, and concrete is supplied from these plants at temperatures up to 150 deg. F.

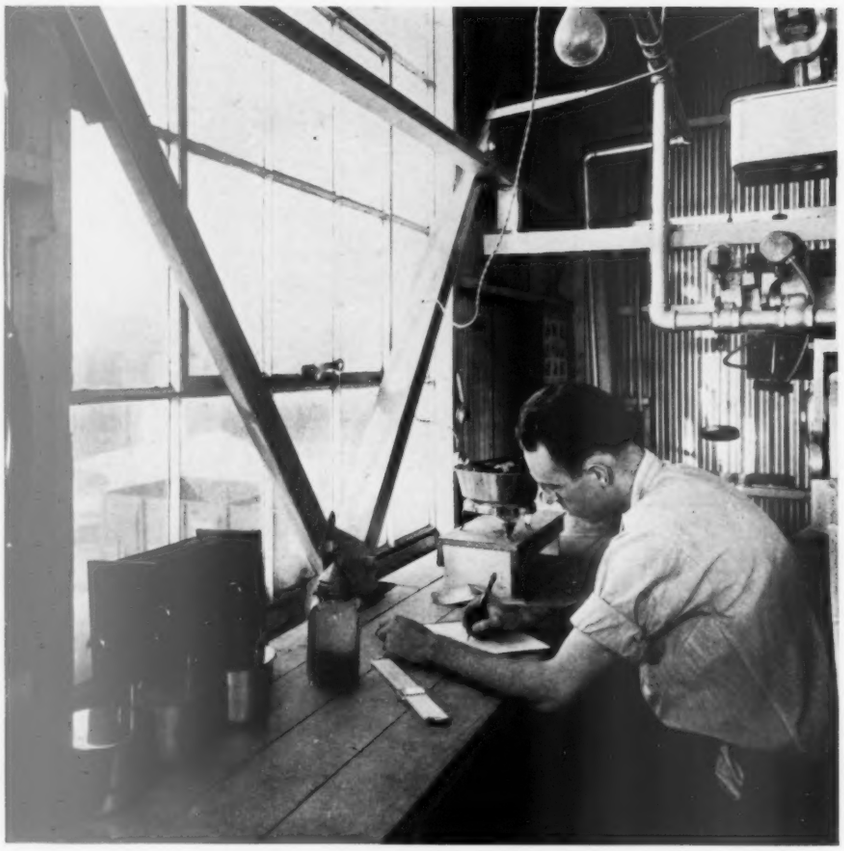
In each plant the precision-control equipment consists of two units of Toledo Scale Co. equipment, one for moisture determination, the other for batch weighing and moisture compensation. By means of a separate scale beam for each ingredient—cement, water, sand and coarse aggregate—with provision for moisture compensation in both aggregates, and automatic electric cut-offs, the exact quantity of each ingredient in each batch is assured. An interesting part is a mirror, outside the window nearest the controls, through which the operator can look into a truck-mixer as it backs in for a load to make sure that all the wash water has been discharged. A spotlight is used for this purpose when operating at night. A Toledo truck-scale is used to weigh out the bulk aggregates at each of the three yards.

The $(SC)^2$ system of control begins at the aggregate plant, where the gravel is screened into three sizes—1½-in. to 1-in., 1-in. to ½-in., and ½-in. to ¼-in. —No. 1, 2 and 3 respectively. These sizes of material are then shipped separately by railway to the Detroit plants, where they are unloaded from the cars into individual bin compartments. This eliminates segregation in loading and handling and is an important factor in making possible accurate control of concrete manufacture. If a concrete with coarse aggregates up to 1½ in. is desired, all three sizes are blended when batching. For a 1-in. aggregate maximum sizes No. 2 and 3 are combined. Size No. 3 is sometimes used alone for heavily-reinforced concrete work.

At Plant No. 1 the aggregates are discharged from hopper cars into a track hopper, from which an inclined bucket-conveyor feeds to a revolving spout serving any of the four compartments of the 320-ton aggregate bin. Cement



A concrete technician (at extreme left) making a specific-gravity determination, using pycnometer, at the weigh-batchers.



A part of the routine laboratory work is making a concrete analysis. Fresh concrete is being dried on the hot plate.

The automatic water-control valves, both dribble and final-cutoff valves being shown. At the left is main control panel and pull chain for opening final-cutoff valve.

is received in bulk by trucks and is unloaded from them into a screw-conveyor. A bucket-elevator discharges cement through a gate into either of the two compartments of the 300-bbl. cement-storage bin.

In weighing out a batch the operator first sets the counterpoise on the sand beam of the scale at the desired dry-sand weight and then adds the correct number of percentage weights for the amount of moisture in the sand. Sand is then released from its bin into the sand compartment of the batcher until the dial scale reads "O." The counterpoise on the coarse-aggregate beam is then set at the desired cumulative weight for all the coarse aggregates to be used and the correct moisture percentage weights are appended. Coarse aggregates are then discharged in turn from their respective bins into the batcher. If three sizes of coarse aggregates are used, the operator mentally subtracts the desired weight of one size from the total weight and stops the dial at that point. The same is done with the second size of aggregate, and the third aggregate brings the dial back to "O."

The poise is next set at the desired point on the cement beam, and the cement discharged from either bin by means of rotary gates again brings the dial back to "O." Compressed air and a manually-operated agitator insure a free, steady flow of cement.

The poise is then set on the water beam at the predetermined total-water-content weight. The percentage weights are then removed from the sand and coarse-aggregate beams to subtract the weight of the water in these materials from the total water weight. As the water flows into its compartment of the batcher the dial again returns to "O" and is automatically shut off at that point. A solenoid actuates a relay, dropping a weight which closes the water valve. This weight is lifted manually to start the water flow. The water valve is actually a dual valve, which can be used to speed up batching when the water supply makes this possible. In this case separate solenoids actuate each valve. The first valve closes when the water weight is within 50 lb. of the desired amount and the second valve closes at the weight. Only one valve is needed in this plant because of the poor water supply. A complete batch can now be turned out every 2 min., but steps are now being taken to improve the water supply so that the batching time can be cut nearly in two.

A duplicate scale dial in the yard office several hundred feet away reveals all the weighing operations on the batcher scale, so that a check can be kept at any time without the operator's

knowledge. All the movements of the weighing scale are also recorded on a graph by a locked recorder on the batching floor. The paper in this recorder moves at the rate of 1½ in. per hr. when no batching is being done, in order to save paper. When the first counterpoise is set the rate changes to 1½ in. per min. The closing of the water valve again shows down the recorder.

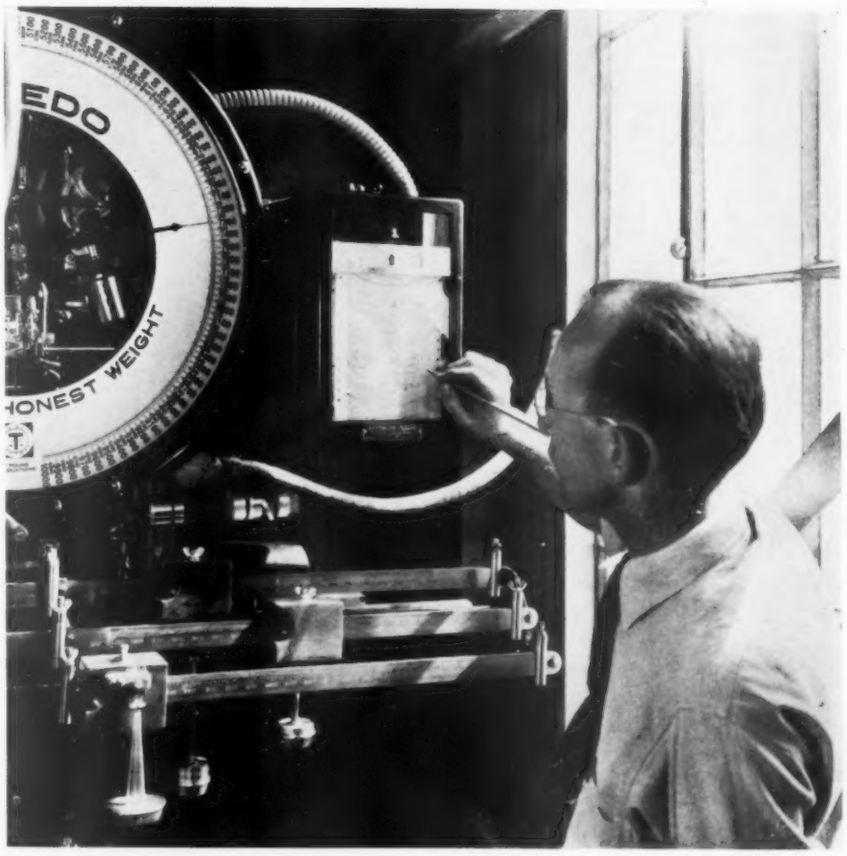
Tests to determine the moisture content of the sand and each size of gravel are made hourly on a Toledo moisture-meter scale, which is calibrated up to 6 lb. in hundredths of a pound. This scale also has a platform for heavier weighing up to 125 lb., which is indicated on another scale on the dial. A container of known weight and volume is suspended from a beam on this dial scale, and the dial segment is set for the specific gravity of the material being checked. The container is then filled with this material until the indicator hits this point on the dial, when the container is removed from the beam, filled with water and shaken until all the air bubbles have been removed. The container is then again suspended from the scale beam and the moisture content of the aggregate is read direct from another small dial segment.

It is seldom necessary to make specific-gravity determinations, as it has been found that sand and gravel from the same pit vary very little. The specific gravity of the sand used varies from 2.66 to 2.68 and a figure of 2.67 is used. The specific gravity of the gravel varies from 2.675 to 2.71 and a figure of 2.69 is used.

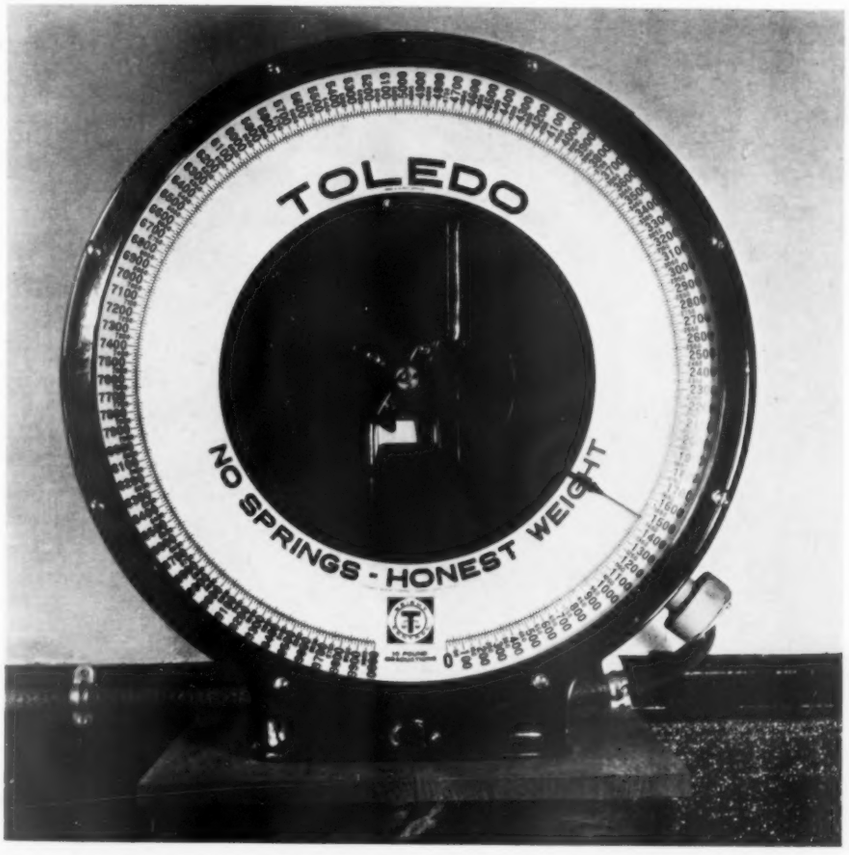
Standard test cylinders are made twice daily and are capped after 24 hr. They are then dipped in molten paraffin, wrapped in heavy paper and dipped again. This prevents any drying out or absorption of moisture and the cylinders are stored in a constant-temperature cabinet. These cylinders are then shipped in padded containers to the laboratory of the Scientific Concrete Service Corp. at Washington, D. C., to be broken at the proper age. The accuracy of this system is illustrated by a series of 14 cylinders taken from a recent large job. This concrete was designed for a strength of 3,000 lb. and the cylinders broke at from 3,000 to 3,700 lb.

At the same time that the cylinders are made samples of the fresh concrete are also analyzed. This concrete is dried out before its initial set and is then weighed and screened to check the water-cement ratio and the percentages of the different sizes of aggregates used.

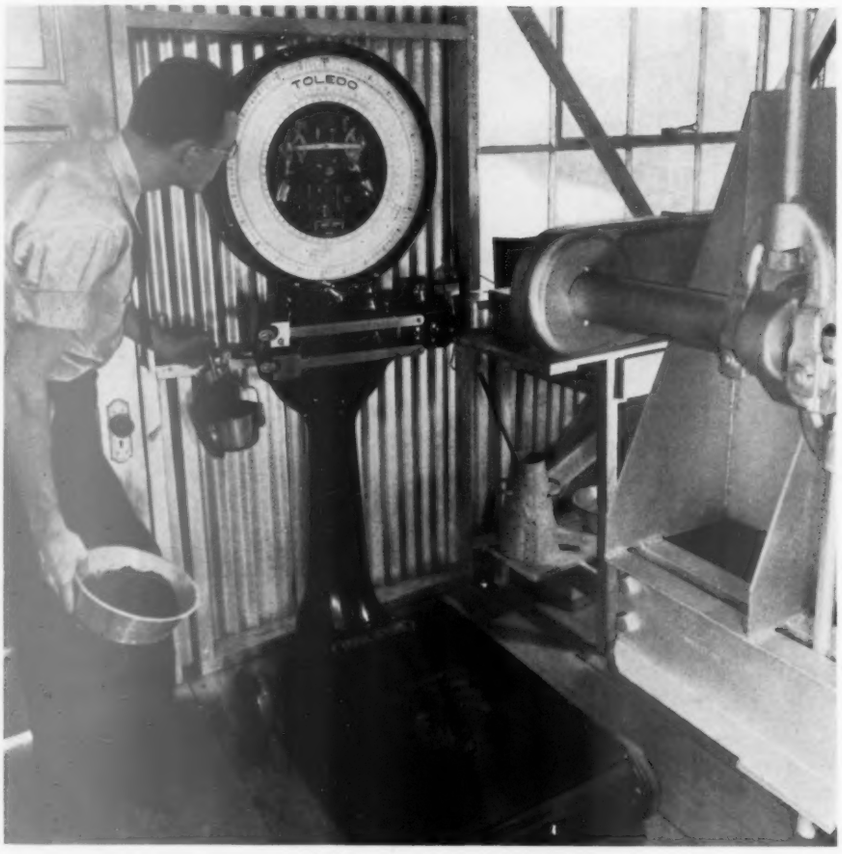
It has been interesting to watch the development of the concrete industry from the late "twenties," when accurate control was seldom considered important, to the present. In the early "thirties" when business was at an all-time



Making a routine entry on the chart graph. The chart travels 1½ in. per min. in actual operation; 1½ in. per hr. at other times.



The remote indicating head, an exact duplicate of the main scale dial but containing no head mechanism. It is actuated by the main scale through synchronous generators.



No mathematical calculation is involved when determining moisture, the percentage of moisture being read directly from the small calibrated segment.

The scale dial, graphic recorder and manual-control levers. For electrical control double cutoffs are provided for each ingredient thus allowing rapid feeding with a dribble finish.

low level, the first general movement toward scientific control was made and progress in this direction has been steady since. There is every indication that in time building codes and specifications for all important construction work will require a concrete as accurately controlled as any other manufactured product.

Detroit, which has one of the most advanced building codes, bases its specifications on 28-day strength and the cement-water ratio, and many other cities and towns have such specifications in their building codes.

The precision control of concrete manufacture through the use of Toledo weighing equipment was developed by Col. Sidney F. Mashbir, president of $(SC)^2$, and first used by him in 1932 in the construction of Koon Dam at Cumberland, Md. A complete description of this operation was published in the June 29, 1932, issue of PIT AND QUARRY. The concrete made for this dam exceeded specifications for strength and impermeability and large savings in cement were effected. This system has been in constant use for the last six years in the plant of William Blakeslee & Sons at New Haven, Conn., and in that of the Edward Balf Co. located at Hartford, Conn.

New Specifications for Gypsum Are Available

On September 29, 1938, the American Standards Assn. approved as an American Standard new specifications for gypsum plastering and for lathing, which were sponsored by the American Society for Testing Materials and the American Institute of Architects.

These specifications represent the first American Standard for plastering and lathing and are of interest to everyone connected with the building industry, particularly those who specify, sell, and erect plastering and lathing materials.

The specifications are divided into two chapters: the first covering the specifications for gypsum plastering; and the second, lathing.

Arrangements are now being made for printing the specifications. Those desiring copies can obtain them gratis by applying to the Gypsum Assn., 211 West Wacker Drive, Chicago.

Acquires Travertine Holdings in Florida

Braden Quarries, Inc., of St. Petersburg, Fla., has purchased the holdings of the Florida Travertine Co. at Samoset, Fla., including 67½ acres of land on which quarries, buildings and machinery are located.

BY-PRODUCTS AID "SOO" GRAVEL FIRM

General view of operations showing dredge, locomotive crane, washing plant, storage and gravity plant.

Steam tug "Chillicothe" hauling a bargeload of gravel through the locks.

SAULT STE. MARIE, Mich., is regarded by most residents of this country as one of its outposts and by others as one of the places to which to go when taking a summer vacation. Its famous locks have always been a great attraction for tourists. Producers of aggregates may be interested to know that in the Soo, as in many other sections of the country, the producers of aggregates have found it profitable to go into the manufacture of by-products in order to dispose of their aggregates.

The Soo Sand & Gravel Co. was founded in 1923 by Fred C. and James Lapish and concentrated on gravel production until 1929, when it began the production of ready-mixed concrete. A Lee truck-mixer was purchased at that time and was used steadily until a few months ago. In 1931 a Jaeger 1-cu. yd. truck-mixer mounted on a Ford truck was purchased. In 1932 the company added a 1½-cu. yd. Jaeger truck-mixer on a Federal truck and in 1937 another 1½-cu. yd. Jaeger mixer on an International truck. Sales of ready-mixed concrete have run as high as 143-cu. yd. daily and 9,000 cu. yd. annually and sales of sand and gravel as high as 60,000 tons. The company also sells crushed stone produced by the Sturgeon Bay Stone Co.

In 1932 a concrete-block machine was installed and this has developed into a profitable side-line. No fewer than 65,000 blocks were sold in 1937 and the output for 1938 is expected to exceed 100,000. This is said to be the only machine-made concrete-block plant in Northern Michigan.

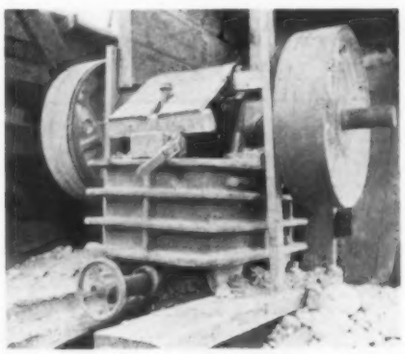
The company gets its gravel and some of its sand from a 120-acre property on the south shore of Whitefish Bay in Lake Superior about 15 mi. west of the Soo. Digging is done with a 2-cu. yd. clam-shell derrick barge operated by a Clyde steam hoist. The gravel is loaded on a 250-cu. yd. barge, which is hauled by the company's 90-ft., 300-hp. steam tugboat, the *Chillicothe*. During busy seasons one barge load is used daily.

When masons' sand is required, material is dredged from another deposit 5 mi. closer to the plant which contains a higher percentage of fine sand. The tug also tows the dredge. The company also does some contract dredging with this equipment and does all the local dredging for slips, etc.

Loading cement into the 1½-cu.yd. truck-mixer which was added to the fleet in 1937.

At the plant, which is located on a slip on the water-front near the east entrance to the Soo locks, aggregates are unloaded by an American 1-cu. yd. steam locomotive crane either to a stock-pile, to the new screening plant or to the old gravity plant.

The crane also rehandles material from the stock-pile to either plant. The gravity plant consists of an inclined gravity screen fitted with interchangeable cloth and set over a bin from which aggregates are batched into the truck-mixers or into dump trucks for delivery. Cement is loaded into the mixers from sacks at a warehouse. This unwashed sand and gravel is so free from



The 9-in. by 18-in. jaw-crusher in the washing-and-screening plant.

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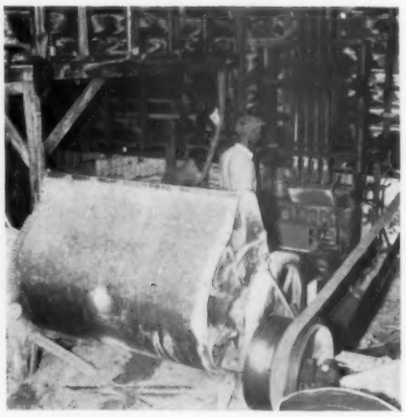
silt and vegetable matter that it is accepted for practically everything except state highway work. The United States government uses it in the construction of locks and other work.

At the new screening plant the material is fed from a bin into a Diamond 9-in. by 18-in. jaw crusher. The crusher product is fed by a bucket-elevator to the 4-ft. by 6-ft., 3-deck Deister Machine Co. vibrating screen, which is equipped with spray nozzles of the same make. The small amount of oversize material is wasted. The sand and three sizes of gravel produced are stored in separate bin compartments. Trucks are loaded under this bin.



The mixer with tamper for producing concrete blocks in the background.

Sand for the block plant is hauled from the bins by trucks and is dumped near the block machine. It is shoveled manually into the 1-cu. yd. Blystone mixer into which cement is dumped from sacks. The concrete is discharged on the floor, from which it is shoveled manually into the Miles tamper block machine. The blocks are spray-cured in a shed before they are moved to outdoor storage.

Study Fire Resistance of Rock Wool in Walls

Several wood-framed partitions with the space between the studs and the facings filled with mineral wool have been included in a current series of fire tests conducted at the National Bureau of Standards in an effort to increase the fire resistance without change in the material or thickness of the facings.

The constructions were built into moveable frames and, for the fire test, were placed to form one wall of the furnace chamber. The tests were conducted in substantial accord with specifications developed under the auspices of several national technical societies and the Bureau. Most of the partitions were tested under load in fire-endurance tests. Fire and hose-stream tests were conducted with constructions that withstood the fire endurance test for one hour or more, and they were found to pass the requirements in this respect, it was stated.

In the first two tests, the loose rock wool was dropped into the stud space in a height of 4 ft. and tamped with a sash weight in the case of the first test, and lightly packed with a stick for the second. Both failed through ignition of boards on the unexposed side at points where there were voids in the fill, the results differing little from those obtained with a similar unfilled partition.

In a partition faced with lime plaster on wood lath, the fill in pellet form was placed by pneumatic means after the partition was built and aged, the equipment used being typical of those applied in placing wall and attic insulations. Failure in this case was also apparently at a void or sparsely filled location in the fill. The partition, however, withstood the test for 16 min. longer than a similar unfilled partition.

Bats were applied as fill in the remaining tests which were of the usual wall-thick types used for house insulation, with waterproofed paper on one side and either gypsum board or gypsum plaster on wood or metal lath on the other. They were 15 in. wide and 23 to 48 in. long, and were placed against one facing for the full height of the partition before the other facing was applied. The filling increased the fire resistance of the construction with the ½-in. gypsum board facing by 10 to 20 min., for that of gypsum plaster on wool lath by 25 to 30 min., and for those of gypsum plaster on metal lath by about 30 min.

The tests indicate in general that the filling of wood-stud partitions results in a substantial increase in fire resistance. The filling apparently retards the transmission of heat to the unexposed facing and decreases the rate of burning of the wood supports. The results indicate that care is needed to obtain a fill without voids. Apparently this condition is more often attained with fills in bat form placed before the last facing is applied than with fills placed after both facings are in place. The former method also affords opportunity for inspection. However, even with this type of construction care must be exercised if good results are to be obtained. The truth of this is brought out in cases where the facing on the side exposed to fire disintegrates or falls off relatively early in the test. Then, if the filling has been nailed in place, or held by equivalent means, added fire resistance is obtained. This is true to a less extent even if the facing does not fall off.

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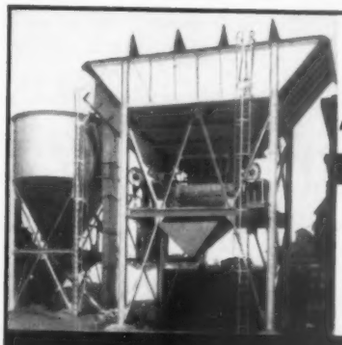

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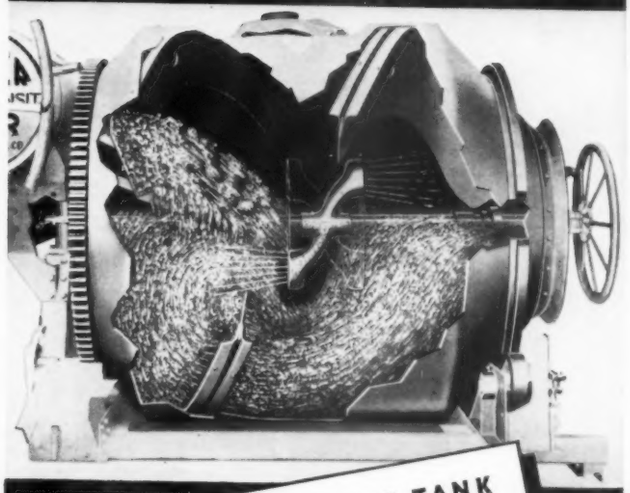

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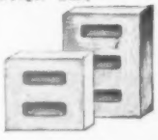

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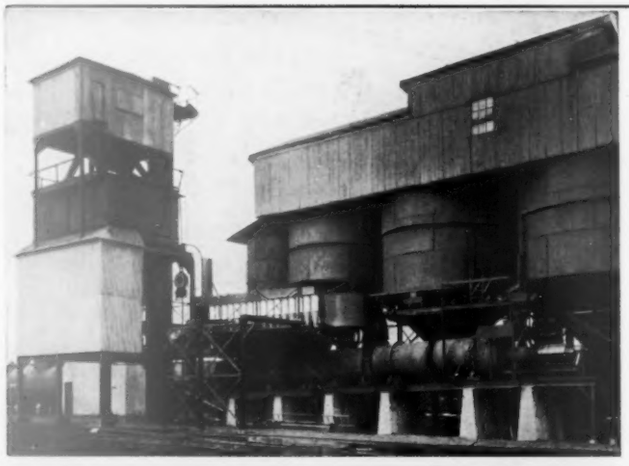

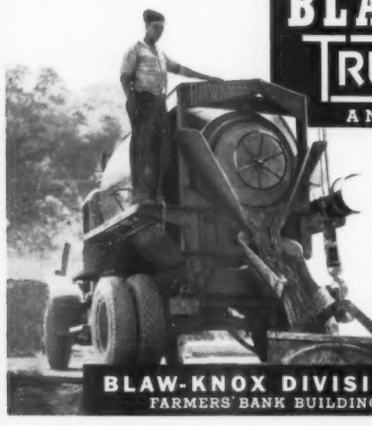

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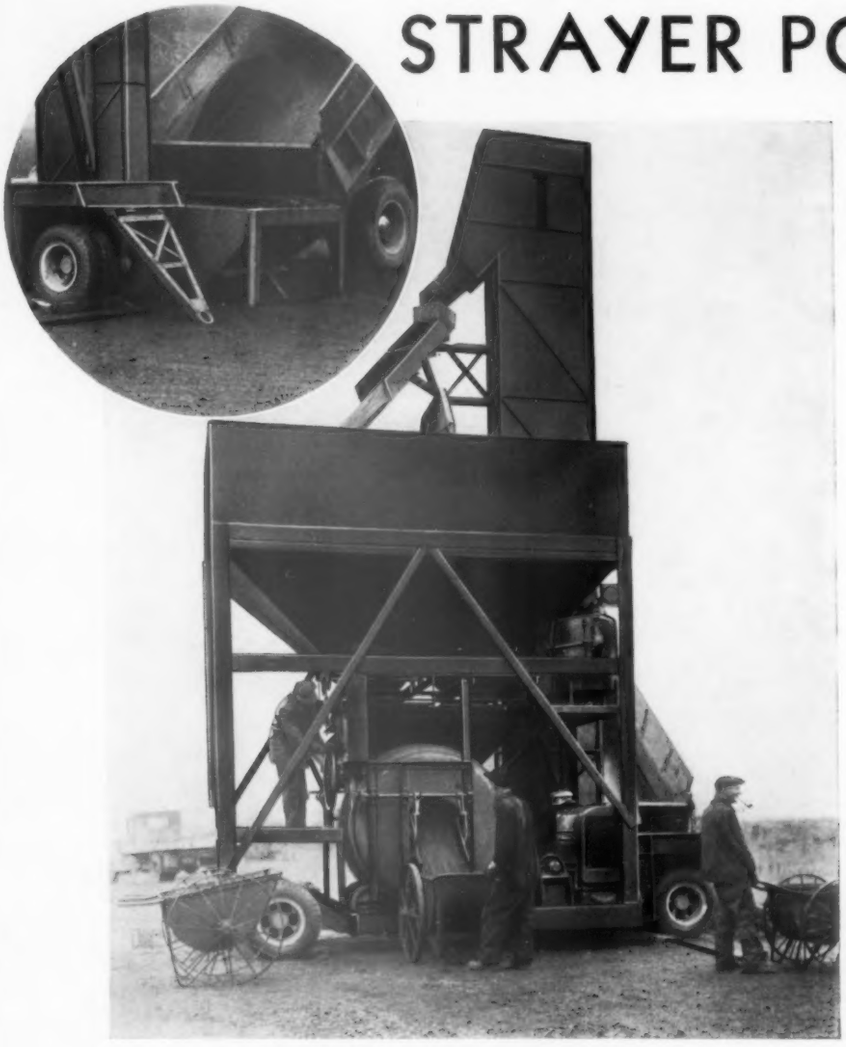

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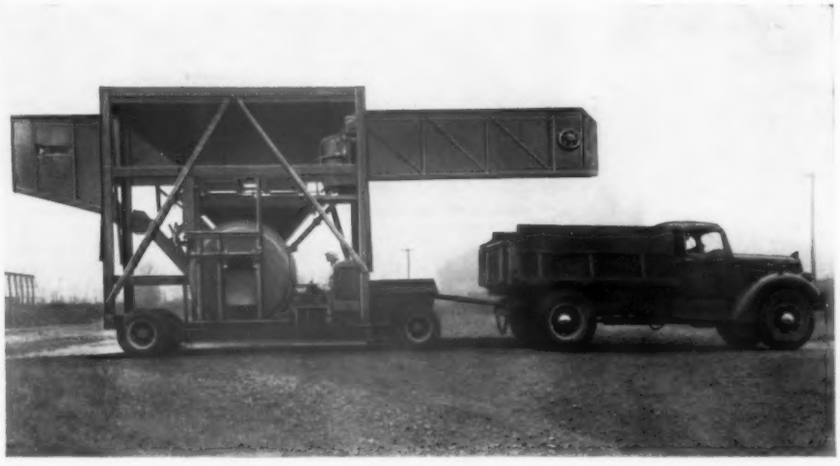

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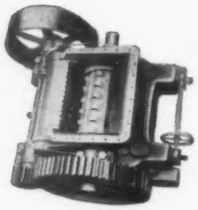

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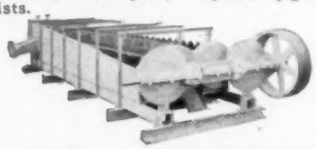

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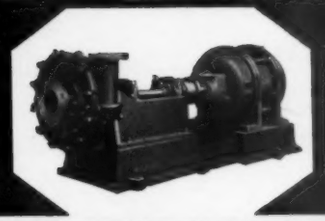
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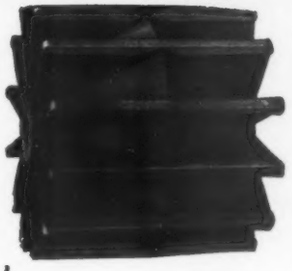
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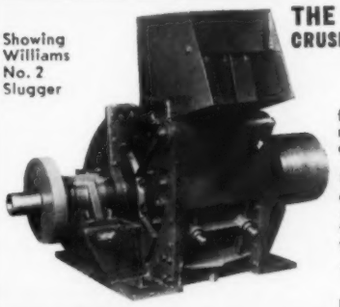
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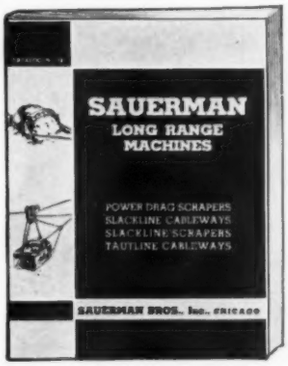

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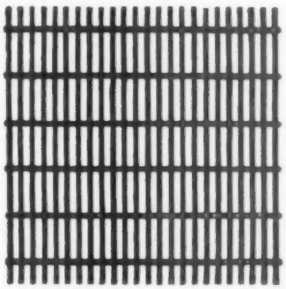
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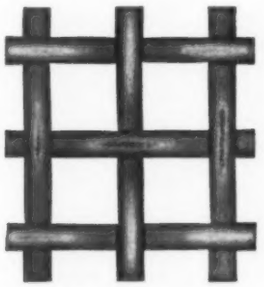
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*Ingersoll-Rand Co.

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*Parsons Engineering Corp.
*Western Precipitation Corp.

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R & L Concrete Machinery Co.

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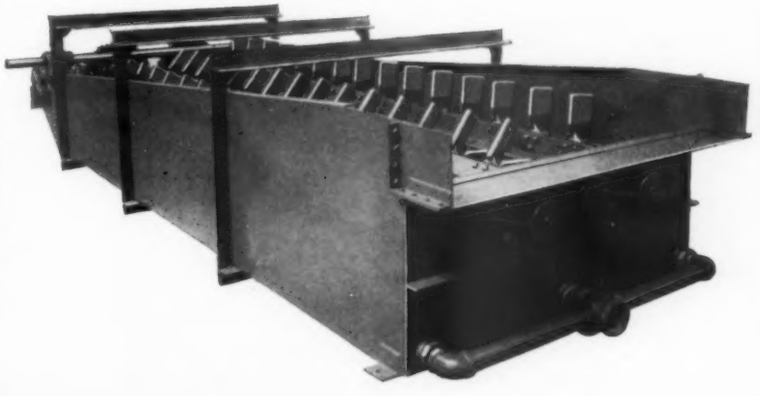

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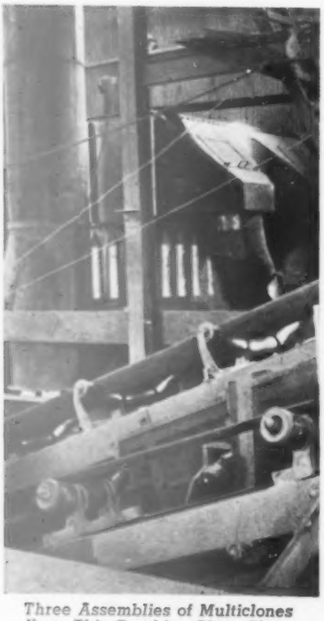

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Diesel Engines (See Engines—Diesel)

Dippers and Teeth (Power Shovel)
*Bucyrus-Erie Co.

Dragline Cableway Excavators
*Bucyrus-Erie Co.
*Link-Belt Co.
*Sauerman Bros., Inc.

Dragline Excavators
*Bay City Shovels, Inc.
*Bucyrus-Erie Co.
Erie Steel Construction Co.
*Link-Belt Co.
Thew Shovel Co.

Draglines (Walking)
*Bucyrus-Monighan Co.

Dredges
*Bucyrus-Erie Co.
Hetherington & Berner, Inc.
*Morris Machine Works

* See also information in the 1938 Pit and Quarry HANDBOOK.

Driers
Allis-Chalmers Mfg. Co.
*Kennedy Van Saun Mfg. & Eng. Co.
Lewistown Fdry. & Machine Co.
McCarter Iron Works, Inc., The
McLanahan & Stone Corp.
*Traylor Eng. & Mfg. Corp.
Tyler Co., W. S.

Drill Bit Reconditioning
*Bucyrus-Erie Co.

Drill Bits
*Ingersoll-Rand Co.

Drill Sharpening Machinery
*Ingersoll-Rand Co.

Drill Steel
*Ingersoll-Rand Co.

Drilling Accessories
*Bucyrus-Erie Co.
*Ingersoll-Rand Co.
Timken Roller Bearing Co.

Drilling Contractors
Hoffman Bros. Drilling Co.
Pennsylvania Drilling Co.

Drills (Blast-Hole)
*Bucyrus-Erie Co.
*Ingersoll-Rand Co.

Drills (Core)
Hoffman Bros. Drilling Co.
*Ingersoll-Rand Co.
Pennsylvania Drilling Co.

Drills (Diamond)
Hoffman Bros. Drilling Co.
Pennsylvania Drilling Co.

Drills (Drifting)
*Ingersoll-Rand Co.

Drills (Hand Hammer)
*Ingersoll-Rand Co.

Drills (Rock)
*Ingersoll-Rand Co.

Drills (Sinking)
*Ingersoll-Rand Co.

Drills (Stoping)
*Ingersoll-Rand Co.

Drills (Wagon)
*Bucyrus-Erie Co.
*Ingersoll-Rand Co.

Drills (Water Well)
*Bucyrus-Erie Co.

Drills (Well) (See Drills — Blast-Hole)

Drives (Multiple Belt, Chain, Rope)
*Allis-Chalmers Mfg. Co.

Dust Arresters
*Blaw-Knox Co.
*Parsons Engineering Corp.
*Western Precipitation Corp.

Dust Collecting Systems
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
*Blaw-Knox Co.
*Parsons Engineering Corp.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.
*Western Precipitation Corp.

Dust Conveying Systems
Allen-Sherman-Hoff Co.
*Blaw-Knox Co.
*Fuller Company
*Parsons Engineering Corp.
*Western Precipitation Corp.

Dust Filters
Parsons Engineering Corp.
*Western Precipitation Corp.

Dust Handling Systems (Hydro Vacuum)
Allen-Sherman-Hoff Co.

Dynamite (See Explosives)

Electrical Equipment
*Allis-Chalmers Mfg. Co.

Electrodes (Welding)
Stulz-Sickles Co.

Elevator Belting (See Belting)

Elevator Buckets (See Buckets —Elevator and Conveyor)

Elevators (See Conveyors and Elevators)

Eliminators (Soft Stone) (See Soft Stone Eliminators)

Engineers
*Allis-Chalmers Mfg. Co.
Bacon, Inc., Earle C.
*Fuller Company
Hetherington & Berner, Inc.
*Kennedy-Van Saun Mfg. and Eng. Corp.
McLanahan and Stone Corp.
*Robins Conveying Belt Co.
*Smidth & Co., F. L.
*Sprout, Waldron & Co.
Sturtevant Mill Co.
*Traylor Engr. & Mfg. Co.

Engine Generator Sets
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Engines (Diesel)
Caterpillar Tractor Co.
*Ingersoll-Rand Co.
*Nordberg Mfg. Co.

Engines (Internal-Combustion)
Caterpillar Tractor Co.
*Ingersoll-Rand Co.
*Nordberg Mfg. Co.

Engines (Steam)
*Ingersoll-Rand Co.
*Morris Machine Works
*Nordberg Mfg. Co.

Excavating Machinery (See Shovels; Cranes; Buckets, etc.)

Excavators—Shallow Grading (Bucket Elevator Type)
*Haiss Mfg. Co., Geo.

Explosives
National Powder Co.

Fabricating (Electric Arc and Oxy-Acetylene)
Stulz-Sickles Co.

Fans (Exhaust)
*Kennedy-Van Saun Mfg. and Eng. Corp.

Feeders
*Allis-Chalmers Mfg. Co.
*Fuller Company
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
*Robins Conveying Belt Co.
Smith Engr. Works
*Sprout, Waldron & Co.
Straub Mfg. Co.
*Traylor Engr. & Mfg. Co.

Floor Sweeping Systems (Hydro Vacuum)
Allen-Sherman-Hoff Co.

Fuses (Detonating)
*Ensign-Bickford Co.
National Powder Co.

Gaskets
Goodyear Tire & Rubber Co.
Quaker City Rubber Co.

Gasoline Engines (See Engines —Internal-Combustion)

Gates (Bin) (See Bin Gates)

Gates (Clamshell)
*Haiss Mfg. Co., Geo.
*Link-Belt Co.

Gears (Herringbone)
*Link-Belt Co.
*Sprout, Waldron & Co.

Gears and Pinions
*Haiss Mfg. Co., Geo.
*Link-Belt Co.
*Sprout, Waldron & Co.

Gelatin (See Explosives)

Generators (See Motors and Generators)

Glass Sand Equipment
Lewistown Foundry & Machine Co.

Grab Buckets (See Buckets—Clamshell, Orange - Peel, etc.)

Grapples
Erie Steel Construction Co.
Owen Bucket Co.

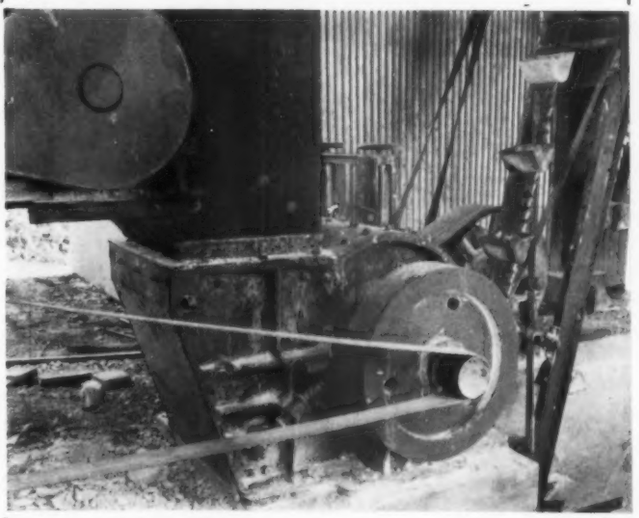
Grating (Steel)
*Blaw-Knox Co.

Grinding Balls (See Balls, Grinding)

Grizzly Feeders
*Traylor Engr. & Mfg. Co.

* See also information in the 1938 Pit and Quarry HANDBOOK.

Make Quarry Waste Yield a Profit with the



Size 30-22 American Ring Crusher, installed at plant of Inkley Marble Quarries, Ste. Genevieve, Mo.

AMERICAN Ring Crusher

•

Inkley Marble Quarries, Ste. Genevieve, Mo., makes waste stone pay a dividend by producing terrazzo chips, stone dust and chicken grits (as told in a story in this issue). It is doing it efficiently and economically with an AMERICAN Ring Crusher. The loosely-hung rings in this AMERICAN machine have many times the life of ordinary hammers and can still do efficient work even when worn down 40 to 50% of their original size. Tramp iron that would wreck other crushers passes through the AMERICAN without injury to the frame. Adjustable to produce any practical degree of fineness—no slivers or finger stones. Investigate this efficient machine that is making money for wide-awake operators everywhere by writing:

•

AMERICAN PULVERIZER CO.

1289 Macklind Ave. **St. Louis, Mo.**

BUYERS' GUIDE

A Directory of Pit and Quarry Advertisers Indexed According to Product.

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Grizzlies
*Allis-Chalmers Mfg. Co.
*Eagle Iron Works
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdry. & Mach. Co.
Manganese Steel Forge Co.
*Robins Conveying Belt Co.
Smith Engr. Works

Guards (Wire)
Manganese Steel Forge Co.

Guns (Hydraulic)
Hetherington & Berner, Inc.
Taylor Forge & Pipe Works

Hammer Mills (See Crushers—Hammer)

Hitchings (Links, Pins, Clevises)
Sanford-Day Iron Works

Hoists
Hetherington & Berner, Inc.
*Ingersoll-Rand Co.
*Jaeger Machine Co.
*Link-Belt Co.
McLanahan and Stone Corp.
*Sauerman Bros., Inc.
Smith Engr. Works
*Sprout, Waldron & Co.

Hoppers
*Link-Belt Co.
Manganese Steel Forge Co.

Hose (Air, Steam and Water)
Goodyear Tire & Rubber Co.
*Ingersoll-Rand Co.
Quaker City Rubber Co.

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Hose (Fire and Suction)
Quaker City Rubber Co.

Hose (Radiator-Engine Cooling)
Goodyear Tire & Rubber Co.
Quaker City Rubber Co.

Hydraulic Guns (See Guns—Hydraulic)

Idlers
*Allis-Chalmers Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
Smith Engr. Works
*Sprout, Waldron & Co.

Indicators (Material Level)
*Fuller Company

Joist and Slab Machines (Concrete)
R & L Concrete Machinery Co.

Kilns and Coolers (Rotary)
*Allis-Chalmers Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Smidth & Co., F. L.
*Traylor Engr. & Mfg. Co.

Kominuters
*Smidth & Co., F. L.

Ladders (Agitating Dredge)
*Eagle Iron Works

Ladders (Hydraulic Dredge)
*Eagle Iron Works

Lime-Handling Equipment
*Fuller Company
*Link-Belt Co.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.
*Robins Conveying Belt Co.
*Traylor Engr. & Mfg. Co.

Lime Kilns
*Kennedy-Van Saun Mfg. and Eng. Corp.

Linings (Ball- and Tube-Mill) (See Mill Liners and Linings)

Loaders and Unloaders
*Bucyrus-Erie Co.
*Fuller Company
*Haiss Mfg. Co., Geo.
*Link-Belt Co.
*Robins Conveying Belt Co.
*Sprout, Waldron & Co.

Magnetic Pulleys (See Pulleys, Magnetic)

Manganese Steel
Manganese Steel Forge Co.

Manganese Steel (Plates and Sheets)
Manganese Steel Forge Co.

Mechanical Rubber Goods
Goodyear Tire & Rubber Co.
Quaker City Rubber Co.

Mill Liners and Linings
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Smidth & Co., F. L.
*Traylor Engr. & Mfg. Co.

Mills (Ball, Tube, etc.)
*Traylor Engr. & Mfg. Co.

Mills (Grinding) (See also Crushers—Hammer)
*Allis-Chalmers Mfg. Co.
*American Pulverizer Co.
*Brooks Equip. & Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdry. & Mach. Co.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.
*Smidth & Co., F. L.
*Sprout, Waldron & Co.
Straub Mfg. Co.
*Traylor Engr. & Mfg. Co.
*Williams Patent Crusher & Pulverizer Co.

Mills (Pug)
McCarter Iron Works, Inc., The

Minerals Separation (Cement) (See Cement Minerals Separation)

Mixers
McCarter Iron Works, Inc., The
Multiplex Concrete Machinery Co.

Motor Trucks
Ford Motor Co.

Motors & Generators
*Allis-Chalmers Mfg. Co.

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Moulds and Forms (Concrete)
Dunn Mfg. Co., W. E.
Multiplex Concrete Machinery Co.
R & L Concrete Machinery Co.

Netting (Locomotive Stack)
*Tyler Co., W. S.

Nozzles (Gravel Washing)
*Deister Concentrator Co.

Nozzles (Hydraulic) (See Guns—Hydraulic)

Nozzles (Spray)
*Deister Concentrator Co.

Packings
Goodyear Tire & Rubber Co.
Quaker City Rubber Co.

Pallets
Multiplex Concrete Machinery Co.

Paving Mixers
*Jaeger Machine Co.

Perforated Metal Plates
*Allis-Chalmers Mfg. Co.
Chicago Perforating Co.
*Sprout, Waldron & Co.

Pipe, Dredge (Floating and Shore)
Naylor Pipe Co.
Taylor Forge & Pipe Works

Pipe Flanges
Hetherington & Berner, Inc.
Naylor Pipe Co.
Taylor Forge & Pipe Works

Pipe Fittings
Hetherington & Berner, Inc.

Pipe Forms (Concrete)
R & L Concrete Machinery Co.
Universal Concrete Pipe Co.

Pipe Machines (Concrete)
R & L Concrete Machinery Co.
Universal Concrete Pipe Co.

Pipe (Spiral)
Naylor Pipe Co.
Taylor Forge & Pipe Co.

Pipe (Water, Gas, Low Pressure Steam)
Hetherington & Berner, Inc.

Pipe (Welded)
Naylor Pipe Co.
Taylor Forge & Pipe Co.

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Portable Conveyors
*Fuller Company
Haiss Mfg. Co., Geo.
*Link-Belt Co.
*Robins Conveying Belt Co.

Portable Crushing and Screening Plants
Brooks Equip. & Mfg. Co.
*Gruendler Crusher & Pulverizer Co.
*Williams Patent Crusher & Pulverizer Co.

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Power Tampers (Concrete)
Multiplex Concrete Machinery Co.

Power Units (Internal-Combustion)
Caterpillar Tractor Co.
*Nordberg Mfg. Co.

Precipitators
*Western Precipitation Corp.

Pre-formed Wire Rope
Broderick & Bascom Rope Co.
*Hazard Wire Rope Division of The American Chain & Cable Co., Inc.
*Leschen & Sons Rope Co., A.

Press Machines (Hand, Concrete)
Multiplex Concrete Machinery Co.

Proportioning Equipment
*Blaw-Knox Co.
Erie Steel Construction Co.
Heltzel Steel Form & Iron Co.
*Jaeger Machine Co.

Pulleys
Sprout, Waldron & Co.

Pulleys (Magnetic)
*Sprout, Waldron & Co.

Pulleys (Wing)
*Sprout, Waldron & Co.

Pulverized Fuel Systems
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.

Pulverizers (See also Crushers, Mills, etc.)
*Allis-Chalmers Mfg. Co.
*American Pulverizer Co.
*Brooks Equip. & Mfg. Co.
*Gruendler Crusher & Pulverizer Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machine Co.
New Holland Machine Co.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.
*Smidth & Co., F. L.
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Traylor Engr. & Mfg. Co.
*Williams Patent Crusher & Pulverizer Co.

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Pumps (Air-Lift)
*Fuller Company
*Ingersoll-Rand Co.

Pumps (Bulk Cement)
*Fuller Company

Pumps (Cement Slurry)
Allen-Sherman-Hoff Co.
*Morris Machine Works
*Smidth & Co., F. L.

Pumps (Centrifugal)
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
Erie Pump & Engine Works
Hetherington & Berner, Inc.
*Ingersoll-Rand Co.
*Jaeger Machine Co.
*Morris Machine Works

Pumps (Dewatering)
Erie Pump & Engine Works
*Morris Machine Works

Pumps (Dredging)
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
Bucyrus-Erie Co.
Erie Pump & Engine Works
Hetherington & Berner, Inc.
*Morris Machine Works

Pumps (Sand and Gravel)
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
Erie Pump & Engine Works

* See also information in the 1938 Pit and Quarry HANDBOOK.

To Meet Your Fine Stone Requirements Use a Secondary

KENNEDY BALL BEARING GEARLESS CRUSHER

To produce the fine cubical stone that concrete and highway work demands you need a Kennedy Secondary Gyratory Crusher.

When set to 3/8" the No. 19 crusher will give you 24 tons per hour, the No. 25 will produce 35 tons per hour, and the No. 37 has a capacity of 60 tons per hour.

The Kennedy Crushers keep up these tonnages month-after month without costly breakdowns and repairs. Your power bills go down because of the exclusive Ball Bearing Gearless drive of the Kennedy Crushers. Special features of design insure a high tonnage of properly sized stone. This is partly due to our patented 3-angle concaves crushing the material against a solid 2-angle mantle.

There's a Kennedy Crusher to solve your problem and produce the stone you can sell. Why not write for our new Bulletin No. 35, 2nd Edition, and learn more about these machines?

Kennedy Van Saun MFG. & ENG. CORP.
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MAXIMIX RUBBER PROTECTION
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CRUSHERS DRY PANS

Lewistown Foundry & Machine Co.
Lewistown, Pa.

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1. Counter balanced shaft
2. Resilient rubber mounting
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GRINDING MACHINERY
for cement, lime, ores, etc.

▼ ▼ ▼

F. L. SMIDTH & CO.
225 Broadway New York, N. Y.

BUYERS' GUIDE

A Directory of Pit and Quarry Advertisers Indexed According to Product.

Although every effort is made to insure accuracy and completeness in these listings, the publisher cannot accept responsibility for errors or omissions. Any mistakes discovered will gladly be rectified.

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*Morris Machine Works

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*Morris Machine Works

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*Morris Machine Works

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*Jaeger Machine Co.

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*Tyler Co., W. S.

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Thew Shovel Co.

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*Sprout, Waldron & Co.

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*Haiss Mfg. Co., Geo.
*Link-Belt Co.
*Sauerman Bros., Inc.

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*Link-Belt Co.
*Traylor Engr. & Mfg. Co.

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Smith Engr. Works

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*Tyler Co., W. S.

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Goodyear Tire & Rubber Co.

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*Nordberg Mfg. Co.

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Quaker City Rubber Co.

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*Allis-Chalmers Mfg. Co.

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*Fuller Co.
*Link-Belt Co.

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*Link-Belt Co.
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*Allis-Chalmers Mfg. Co.
*Eagle Iron Works
*Haiss Mfg. Co., Geo.
*Kennedy-Van Saun Mfg. and Eng. Corp.
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*Link-Belt Co.
McLanahan and Stone Corp.
*Smidth & Co., F. L.
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Straub Mfg. Co.
*Traylor Engr. & Mfg. Co.
*Tyler Co., W. S.

Weighing Equipment (Automatic)
*Blaw-Knox Co.
Erie Steel Construction Co.
*Fuller Co.
Heltzel Steel Form & Iron Co.
*Jaeger Machine Co.

Welding Bars, Wedge and Applicator (Nickel - Manganese Steel)
Stulz-Sickles Co.

Welding and Cutting Equipment
Stulz-Sickles Co.

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Wheels (Car)
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Winches and Capstans
*Link-Belt Co.
*Robins Conveying Belt Co.
*Sprout, Waldron & Co.

Wire Cloth
Cleveland Wire Cloth & Mfg. Co.
Ludlow-Saylor Wire Co.
Manganese Steel Forge Co.
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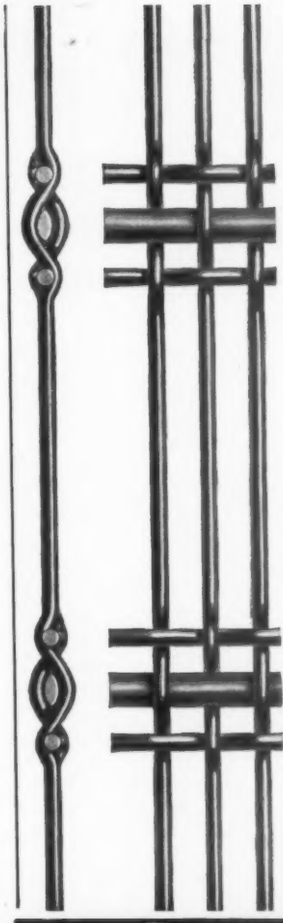
* See also information in the 1938 Pit and Quarry HANDBOOK.



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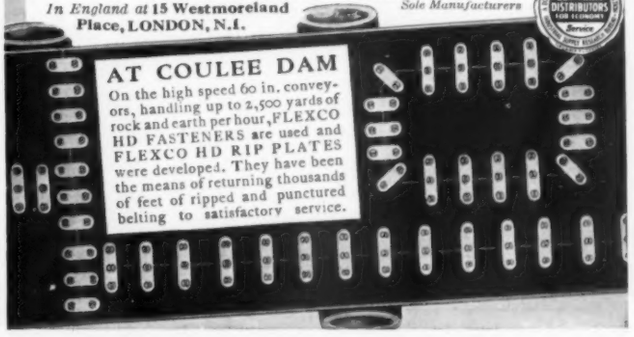
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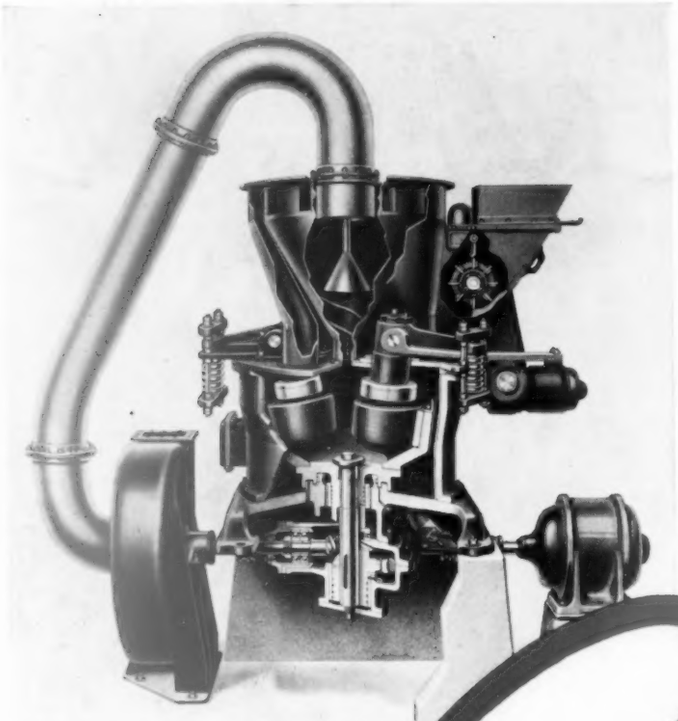

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